SELECTED WATER RESOURCES ABSTRACTS

VOLUME 4, NUMBER 23
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UNIVERSITY OF KENTUCKY
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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency, Water Quality Office. A directory of the Centers appears on inside back cover.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

WATER,
University of East Anglia, Norwich (England).
For primary bibliographic entry see Field 02K.
W71-12270

CLUSTERING OF SULFUR DIOXIDE AND WATER VAPOR ABOUT OXONIUM AND NITRIC OXIDE IONS,
Brookhaven National Lab., Upton, N.Y.
A. W. Castleman, Jr., I. N. Tang, and H. R. Munkelwitz.
Science, Vol 173, No 4001, p 1025-1026, September 10, 1971. 2 fig, 10 ref.

Descriptors: *Ions, *Ion transport, *Electrochemistry, *Water vapor, Lightning, Humidity, Gases, Sulfur compounds, Nitrogen compounds, Oxygen, Water chemistry, Atmospheric physics.
Identifiers: *Nitric oxide, Oxonium ions.

A study of the chemistry of ions and molecular clusters formed in an electrical discharge in the presence of SO2 and water vapor is described. Results presented establish the existence and identity of mixed clusters of H2O and SO2 about common ions such as NO and H3O which are present in electrical discharges. The mobility of ions produced under the studied conditions are generally lower than those expected for simple ions. Mass spectrometric identification reveals that species composed of water vapor and sulfur dioxide molecules clustering about common atmospheric ions are formed under these conditions. Identification of these clusters provides an explanation for the effect of trace gases on the mobilities of ions. (Lang-USGS)
W71-12475

AN NMR AND CALORIMETRIC STUDY OF THE INTERACTIONS BETWEEN LANTHANIDE IONS AND WATER,
New Mexico State University, University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 02K.
W71-12695

02. WATER CYCLE

2A. General

RUNOFF GROUPING FOR DETECTION OF CHANGE IN RUNOFF,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. Nakamichi, and H. J. Morel-Seytoux.
ASCE Proceedings, Journal of the Irrigation and Drainage Division, Vol 97, No IR-2, Paper 8201, p 275-290, June 1971. 6 fig, 2 tab, 20 ref. USBR 14-06-D-6597.

Descriptors: *Weather modification, *On-site tests, *Colorado, *Colorado River Basin, Evaluation, Rainfall-runoff relationships, Precipitation (Atmospheric), Analytical techniques, Stream gages, Data collections, Optimization.
Identifiers: Runoff-change detection.

Methods were studied for determination of suitable watersheds or combinations of watersheds for precipitation management programs in the upper Colorado River Basin, particularly for the San Juan Mountains. The introduction of optimal weight factors in the linear combination of runoff from several basins will reduce significantly the number of years necessary for evaluation of the operations. The attainment of a 20% increase in winter precipitation is necessary to permit evaluation within the planned duration (4 yr-5 yr) of the experiments. (Knapp-USGS)
W71-12250

HYDROLOGIC RESPONSE OF WATERSHEDS TO LAND USE MANAGEMENT,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 04C.
W71-12251

FITTING METHODS FOR CONCEPTUAL CATCHMENT MODELS,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
R. P. Ibbitt, and T. O'Donnell.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, Paper 8370, p 1331-1342, September 1971. 2 fig, 4 tab, 18 ref, append.

Descriptors: *Mathematical models, *Optimization, *Systems analysis, *Rainfall-runoff relationships, Computer programs, Runoff forecasting, Simulation analysis, Evaporation, Precipitation (Atmospheric), Parametric hydrology.
Identifiers: Catchment models.

To use conceptual (mathematical) models of catchment hydrology, it is first necessary to know the values of the parameters that control the behavior of the model. This has usually been done by fitting the model subjectively to actual data. Automatic optimization methods programmed for high-speed digital computers were used to fit a model objectively to given catchment data. A simple model incorporating the types of component used in more realistic models was used to test nine different optimization methods. A brief description of how each optimization method works is given. By using synthetic error-free data, test problems with known solutions were constructed. Of the nine methods tested, a modified version of the deterministic rotating coordinate method of Rosenbrock was found to be the most effective for fitting the test model. (Knapp-USGS)
W71-12257

HOURLY RAINFALL SYNTHESIS FOR A NETWORK,
Hydrocomp International, Palo Alto, Calif.
For primary bibliographic entry see Field 02B.
W71-12259

BIBLIOGRAPHY ON ATMOSPHERIC (CYCLIC) SEA-SALTS,
Army Natick Labs., Natick, Mass. Earth Sciences Lab.
For primary bibliographic entry see Field 02B.
W71-12278

HYDROLOGIC EVALUATION OF GEMINI PHOTOGRAPHS OF FRINGES OF THE SAHARA, AFRICA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07B.
W71-12279

QUADRILINGUAL COLLECTION OF USUAL WORDS IN HYDROLOGY,
Office de La Recherche Scientifique et Technique Outre-Mer, Paris (France). Hydrology Section.
For primary bibliographic entry see Field 10.
W71-12291

NUMERICAL ROUTING OF FLOOD HYDROGRAPHS THROUGH OPEN CHANNEL JUNCTIONS,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 02E.
W71-12320

STUDIES OF THE ATMOSPHERIC WATER BALANCE,
Colorado State Univ., Ft. Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 02B.
W71-12329

THE INSTANTANEOUS UNIT HYDROGRAPH: ITS CALCULATION BY THE TRANSFORM METHOD AND NOISE CONTROL BY DIGITAL FILTERING,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
Ramachandra A. Rao, and J. W. Delleur.
Available from the National Technical Information Service as PB-202 701, $3.00 in paper copy, $0.95 in microfiche. Indiana Water Resources Research Center, Lafayette, Technical Report No 20, June 1971. 41 p, 22 fig, 18 ref. OWRR Project B-008-IND (5) and B-022-IND (1).

Descriptors: *Rainfall-runoff relationships, *Precipitation excess, *Instantaneous unit hydrograph, Mathematical models, Fourier analysis, LaPlaces equation, Indiana, Linear systems analysis, Watershed hydrographs.
Identifiers: *Kernel function, Z transform.

Linear system analysis techniques are used to evaluate the kernel function (instantaneous unit hydrograph). The methods used were the Fourier, the LaPlace and the Z-transform requires the least computer time, but the Fourier transform provides the best insight in the understanding of the methodology. Oscillations of the kernel function were often observed. These were either generated by the computational procedure or by the noise in the data. The oscillations due to the computational procedure are, in general, related to the discretization rate, and often can be controlled by increasing the time step in the discretization of the data. The oscillations due to noise in the data usually can be controlled by digital filtering. Of particular importance is the selection of the truncation values in the numerical integrations in the transform domain, the selection of the proper number of intervals in these integrations and in the discrete convolution which approximates the convolution integral. The properties of the noise attributed to the rainfall excess data are discussed. Computational techniques are illustrated by several examples using data from rural and urban Indiana watersheds.
W71-12330

WATER AND WATER POLLUTION HANDBOOK, VOLUME 1.

Marcel Dekker, Inc., New York, N.Y., 1971. 449 p.

Descriptors: *Hydrology, *Water pollution, *Water resources development, *Ecosystems, *Watershed management, Water pollution effects, Water pollution control, Surface waters, Groundwater, Sedimentation, Hydrologic cycle, Model studies, Water chemistry, Water quality.

This handbook contains nine chapters concerning water resources and water pollution problems. The chapter headings are: (1) Chemical, Physical, and Biological Characteristics of Water Resources, (2) Physical, Chemical, and Biological Characteristics of Estuaries, (3) Chemical, Physical, and Biological Characteristics of Irrigation and Soil Water, (4) Self-Purification in Natural Waters, (5) Use of Computer Technology to Develop Mathematical Models for Natural Water Systems, (6) The Effects of Pollution upon Aquatic Life, (7) Chemical, Physical, and Biological Characteristics of Wastes and Waste Effluents, (8) Chemical and Physical Purification of Water and Waste Water, and (9) Biological Waste Treatment. (See also W71-12348 thru W71-12355) (Woodard-USGS)
W71-12347

CHAPTER 1. CHEMICAL, PHYSICAL, AND BIOLOGICAL CHARACTERISTICS OF WATER RESOURCES,
Geological Survey, Washington, D.C.
W. H. Durum.
In: Water and Water Pollution Handbook, Vol 1, New York, N.Y., Marcel Dekker, Inc., p 1-49, 1971. 12 fig, 9 tab, 47 ref.

Descriptors: *Hydrologic data, *Chemical analysis, *Physical properties, *Biological properties, *Water resources, Surface waters, Groundwater, Sedimentation, Rainfall, Hydrologic cycle, Hydrogeology, Water quality, Water chemistry, Reviews, Bibliographies.

Natural chemical, physical, and biological characteristics of surface water and groundwater resources are summarized. The main topics of discussion include (1) Chemistry of Rainwater, (2) Nitrogen Compounds in Groundwater and Rainwater, (3) Groundwater and Equilibrium, (4) Surface Water, Giant Vehicle for Transport, (5) River Chemical Composition and Loads, (6) Water and Sediment Considerations, (7) Transport of Dissolved and Suspended Load, (8) Temperature Characteristics, (9) Oxygen and Reaeration Capacity, and (10) Design of Water Quality Data Programs. (See also W71-12347) (Woodard-USGS)
W71-12348

CHAPTER 2. PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF ESTUARIES,
Gulf Coast Research Lab., Ocean Springs, Miss.
W. Abbott, C. E. Dawson, and C. H. Oppenheimer.
In: Water and Water Pollution Handbook, Vol 1, New York, N.Y., Marcel Dekker, Inc., p 51-140, 1971. 13 fig, 7 tab, 299 ref.

Descriptors: *Estuaries, *Water chemistry, *Physical properties, *Biological properties, *Water pollution sources, Sedimentation, Salinity, Mollusks, Water temperature, Plankton, Ecosystems, Ecology, Environmental effects, Reviews, Bibliographies.

Chemical, physical, and biological characteristics of estuaries are summarized. The report deals primarily with a 'typical' estuary such as an estuary associated with one of the alluvial deltaic pans that are scattered over most of the temperate and tropical coastlines of the earth at the mouths of rivers. Well-known examples are associated with such great rivers as the Amazon, the Mississippi, the Indux, and the Ganges, to mention only a few. Physical characteristics discussed include morphology and classification, circulation and mixing, gas exchange, sedimentation, and temperature effects. Chemical characteristics cover inorganic and organic aspects. Biological characteristics are concerned with estuarine biota, productivity of estuaries, and stresses in the estuarine environment. A section on pollution deals with nontoxic, toxic, thermal, and radioactive pollution. (See also W71-12347) (Woodard-USGS)
W71-12349

CHAPTER 3. CHEMICAL, PHYSICAL, AND BIOLOGICAL CHARACTERISTICS OF IRRIGATION AND SOIL WATER,
Department of Agriculture, Riverside, Calif., Salinity Lab.
J. D. Rhoades, and L. Bernstein.
In: Water and Water Pollution Handbook, Vol 1, New York, N.Y., Marcel Dekker, Inc., p 141-222, 1971. 29 tab, 283 ref.

Descriptors: *Irrigation, *Soil water, *Water chemistry, *Physical properties, *Biological properties, Water pollution sources, Hydrologic data, Agriculture, Fertilizers, Water quality, Chemical analysis, Rain water, Bibliographies.

Chemical, physical, and biological characteristics of irrigation and soil water are summarized. Humid zone soil waters as well as those in the arid zones are discussed under the following main topics: (1) Properties of Waters Involved in or Affected by Agriculture, (2) Quality Criteria and Standards for Irrigation Water, (3) Minimizing Pollution and Degradational Effect of Agriculture on Water Quality, and (4) Agriculture as an Ameliorative Agent for Water Quality. (See also W71-12347) (Woodard-USGS)
W71-12350

CHAPTER 4. SELF-PURIFICATION IN NATURAL WATERS,
Ecoscience Lab., Norwich, Conn.
R. J. Benoit.
In: Water and Water Pollution Handbook, Vol 1, New York, N.Y., Marcel Dekker, Inc., p 223-261, 1971. 7 fig, 4 tab, 88 ref.

Descriptors: *Water pollution sources, *Self-purification, *Surface waters, *Natural streams, Ecosystems, Chemical reactions, Water chemistry, Reviews, Water quality, Dissolved oxygen, Biological properties, Physical properties, Bibliographies.

Physical, chemical, and biological processes in self-purification of natural waters are presented under the following topics: (1) Dilution and Mixing, (2) Sorption and Sedimentation, (3) Solubility Equilibria, (4) Acid-Base Reactions, (5) Organic Matter in Natural Waters, (6) Redox Reactions, (7) Dissolved Oxygen Relations, (8) Reaeration, (9) Normal Biological Processes, (10) General Systems Model, (11) Trophic Dynamic Models, and (12) Biological Effects of Pollution. (See also W71-12347) (Woodard-USGS)
W71-12351

CHAPTER 5. USE OF COMPUTER TECHNOLOGY TO DEVELOP MATHEMATICAL MODELS FOR NATURAL BODIES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
A. R. Le Feuvre.
In: Water and Water Pollution Handbook, Vol 1, New York, N.Y., Marcel Dekker, Inc., p 263-295, 1971. 3 fig, 23 ref.

Descriptors: *Hydrology, *Hydrologic models, *Computer models, *Mathematical models, *River basins, Watershed management, Streamflow, Streamflow forecasting, Surface-Groundwater relationships, Rainfall-runoff relationships, Bibliographies.

A brief discussion of mathematical models and computer technology concerning hydrology is followed by a description of the various natural bodies to be simulated. Finally, the techniques of optimization are introduced to point the way toward future qpplications. Most hydrologic models are extensive rather than intensive. The model attempts to simulate the behavior of a large and complex system covering many square miles. Because of this, it is necessary to recognize local mechanisms in terms of average conditions. For instance, the infiltration capacity of the ground varies with soil characteristics and vegetal cover. When considering a watershed of several hundred square miles, therefore, it is meaningless to refer to specific local conditions. The Stanford watershed model recognizes this by assuming a linear variation of infiltration rate as precipitation continues. This mechanism assumes that ground surface conditions vary throughout the watershed and that as time progresses, various elements of the watershed area will control the average infiltration rate. (See also W71-12347) (Woodard-USGS)
W71-12352

CHAPTER 6. THE EFFECTS OF POLLUTION UPON AQUATIC LIFE,
Washington Univ., Seattle. Coll. of Fisheries.
M. Katz.
In: Water and Water Pollution Handbook, Vol 1, New York, N.Y., Marcel Dekker, Inc., p 297-328, 1971. 2 tab, 77 ref.

Descriptors: *Water pollution sources, *Water pollution effects, *Aquatic life, *Surface waters, Ecosystems, Water quality, Water quality control, Domestic wastes, Industrial wastes, Agricultural chemicals, Thermal pollution, Taste, Odor, Fishkill, Bibliographies.
Identifiers: *Water quality standards.

The wastes which are discharged into waterways can be classified into four general types: domestic, industrial, agricultural, and radioactive. The effects of the first three types of wastes upon aquatic organisms, particularly fish, are briefly discussed; major emphasis is given to industrial waste components. Two other related subjects, taste and odor problems and thermal pollution are included. (See also W71-12347) (Woodard-USGS)
W71-12353

CHAPTER 7. CHEMICAL, PHYSICAL, AND BIOLOGICAL CHARACTERISTICS OF WASTES AND WASTE EFFLUENTS,
Water Pollution Research Lab., Stevenage (England).
H. A. Painter.
In: Water and Water Pollution Handbook, Vol 1, New York, N.Y., Marcel Dekker, Inc., p 329-364, 1971. 1 fig, 7 tab, 153 ref.

Descriptors: *Water quality, *Chemical analysis, *Water pollution sources, Water pollution effects, *Analytical techniques, Domestic wastes, Industrial wastes, Water resources development, Sampling, Quality control, Bibliographies.

Methods for analyzing chemical, physical, and biological characteristics of wastes and waste effluents are presented. Knowledge of the composition of sewage and of trade waste waters aids in selecting methods of treatment before discharging to a river or a stream. In particular, such knowledge will help to determine whether or not a trade waste would attack the sewer, whether it should be treated alone or in admixture with sewage--and in what proportions--and whether a single-stage or multistage process should be adopted. Further, a thorough survey of the processes from which the various components of a trade waste arise, together with their composition, often leads to recovery of materials and saving of water. An analysis of treated waste waters is necessary to assess potential toxicity and disease hazard to man, toxicity to fish and other river life, and trophic properties for algae, 'sewage fungus,' etc. (See also W71-12347) (Woodard-USGS)
W71-12354

WATER AND WATER POLLUTION HANDBOOK, VOLUME 2.
Marcel Dekker, Inc., New York, N.Y., 1971. 800 p.

Descriptors: *Water resources development, *Water pollution sources, *Water quality, *Water pollution control, *Water pollution effects, *Water chemistry, Analytical techniques, Ecosystems, Ecology, Instrumentation, Biological properties, Water analysis.

This handbook (volume 2 of four volumes) contains five chapters by different authors concerning water resources and water pollution problems. The chapter headings and the author (s) of each are: 1. Sampling in Natural Waters and Waste Effluents, Darrell L. King; 2. Concentration and Separation Techniques, Julian B. Andelman and S. Charles Caruso; 3. Insoluble Material in Natural Water, William Tuthill Lammers; 4. Bacterial and Viral Analysis of Water and Waste Water, Pasquale V. Scarpino; and 5. Toxicity Bioassay Techniques Using Aquatic Organisms, Max Katz. Emphasis is placed on the importance of integrating newer methods of water analysis with those of older investigations. Methods of qualitative and quantitative characterization are presented. (See also W71-12347) (Woodard-USGS)
W71-12355

SIMULATION OF CONTINUOUS REALIZATIONS OF THE STREAMFLOW PROCESS FOR COMPUTING REGULATION,
G. G. Svanidze.
Translated from Transactions of the Power Engineering Institute (Trudy Instituta energetiki), Vol. 18, 1969, pp. 124-129. Soviet Hydrology: Selected Papers, No 6, p 578-582, 1969. 5 p, 14 ref.

Descriptors: *Mathematical models, *Statistical models, *Stochastic processes, *Simulation analysis, Variability, Correlation analysis, Streamflow, Regulation, Flood control, Time series analysis, Mathematical studies.
Identifiers: *USSR.

Natural streamflow is a nonstationary random process with continuous time. Therefore, it is impossible to solve any regulation problem without introducing some hypotheses, especially in the statistic variant when a mathematical flow model must be constructed on the basis of observational data. A hypothesis which is very convenient in the case of streamflow is: (1) a periodic process with a period of one year; or (2) the sum of the periodic process and some determined function. In the discrete variant, when we deal with mean annual water discharges, this corresponds to a stationary process and a stationary process with a trend. The model makes it possible to use original statistical material for estimating some probability characteristics and then, after the appropriate hypothesis has been introduced, to construct a corresponding multi-dimensional distribution function. One of the possible hypotheses will be a multi-dimensional normal distribution of any finite number of random variables, whose one-dimensional distribution functions are normal and whose correlation matrix is positive defined. Normal processes are a characteristic subclass of this class. (Knapp-USGS)
W71-12397

EXPERIMENTAL STUDIES OF RAINFALL RUNOFF FORMATION UNDER PERMAFROST CONDITIONS,
Gidrometeorologicheskii Institut, Odessa (USSR).
For primary bibliographic entry see Field 02C.
W71-12399

FACTORS AFFECTING WATER QUALITY OF SMALL MOUNTAIN CATCHMENTS,
Swiss Forest Research Inst., Birmensdorf (Switzerland).
For primary bibliographic entry see Field 02K.
W71-12425

THE HYDROLOGICAL BUDGET AND COMPUTATION OF GROUND-WATER COMPONENTS OF RIVER DISCHARGE IN THE NORTH-WEST PART OF POLICE REPRESENTATIVE BASIN IN CZECHOSLOVAKIA,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
M. Svoboda.
In: Wellington Symposium - The Results of Research on Representative and Experimental Basins; December 1-8, 1970, New Zealand: New Zealand Journal of Hydrology, Vol 9, No 2, p 252-280, 1970. 29 p, 29 fig, 4 tab, 10 ref.

Descriptors: *Water balance, *Hydrologic budget, *Groundwater basins, *Data collections, *Hydrologic data, Surveys, International Hydrological Decade, Gaging stations, Groundwater movement, Water yield, Hydrogeology.
Identifiers: *Czechoslovakia, *IHD Representative Basins, *Experimental watersheds.

A hydrological budget was calculated for a geological structure with shallow and deep aquifers, the Adrspach-Teplice part of the Police Triassic-Cretaceous basin in the upper part of the Metuje River near the northern border of Czechoslovakia. Groundwater resources are of the best quality in the region, and can be used for water supply. Because the climate and hydrology represent a significant type of Central European condition, it was chosen as a representative watershed for the International Hydrological Decade. Detailed water balance data are tabulated. (Knapp-USGS)
W71-12426

EVALUATION OF A DIGITAL CATCHMENT MODEL ON NEW ZEALAND CATCHMENTS,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W71-12431

AN EMPIRICAL RELATIONSHIP BETWEEN RAINFALL AND RUNOFF,
Ministry of Works, Hamilton (New Zealand). Water and Soil Div.
R. J. Pittams.
In: Wellington Symposium - The Results of Research on Representative and Experimental Basins; December 1-8, 1970, New Zealand: New Zealand Journal of Hydrology, Vol 9, No 2, p 357-372, 1970. 16 p, 1 fig, 7 tab.

Descriptors: *Rainfall-runoff relationships, *Data collections, Parametric hydrology, Depth-area-duration analysis, Antecedent precipitation, Hydrograph analysis, Peak discharge, Lag time, Routing, Statistics, Mathematical models.
Identifiers: *Experimental watersheds.

A relationship was derived for the prediction of runoff from rainfall, using the basic hypothesis that a rainfall increment, when suitably modified by factors representing catchment response and antecedent rainfall effect, can be used as an index for discharge so that the sum of all the index increments gives the total storm runoff. The various parameters are explained and examples given to demonstrate the feasibility of the technique and the flexibility of its application. The ultimate success of the relationship depends on the ability to identify accurately the parameters for individual catchments from historical runoff and rainfall records. Subsequent calculation by a large computer can provide the generality and complexity often lacking in 'lumped' catchment models. (Knapp-USGS)
W71-12433

REFORESTATION INFLUENCES ON SMALL WATERSHED STREAMFLOW,
Agricultural Research Service, Coshocton, Ohio. North Appalachian Experimental Watershed.
For primary bibliographic entry see Field 04C.
W71-12450

ESTIMATION OF DESIGN HYDROGRAPHS FOR SMALL RURAL CATCHMENTS,
New South Wales Univ. Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 02E.
W71-12463

SPECTRAL METHODS OF STUDYING HYDROLOGIC SERIES (O spektral'nykh metodakh issledovaniya gidrologicheskikh ryadov),
Akademiya Nauk SSSR, Moscow. Inst. of Water Research.
For primary bibliographic entry see Field 02E.
W71-12611

VARIABILITY OF WIND-DRIVEN AND THERMOHALINE CURRENTS IN THE NORTH ATLANTIC IN RELATION TO VARIATIONS IN MACROSYNOPTIC PROCESSES,
Gidrometeorologicheskii Institut, Leningrad (USSR).
B. I. Tyuryakov, and L. N. Kuznetsova.
Oceanology (USSR), Vol 10, No 5, p 596-607, 1970. 12 p, 3 fig, 13 ref.

Descriptors: *Ocean circulation, *Ocean currents, *Atlantic Ocean, *Synoptic analysis, Density currents, Thermal stratification, Atmospheric physics, Winds.
Identifiers: *Ocean-atmosphere interactions, Thermohaline currents.

Theoretical computations were made of the three-dimensional stationary field of wind-driven and thermohaline currents in the North Atlantic. The theoretical model of P.S. Lineykin, based on the linear theory of the baroclinic ocean layer, was used in the computations. This method was supplemented by several improvements. For example, a new form of boundary condition for the main differential equation was used to compute thermohaline currents. Lineykin's method is sufficiently sensitive to variations in atmospheric pressure, heat budget, precipitation, and evaporation. This method can be used to study the variability of wind-driven and thermohaline currents which are associated with variations in macrosynoptic processes. (Knapp-USGS)
W71-12653

HYDROLOGIC CHARACTERISTICS OF SMALL HEADWATER CATCHMENTS IN THE OUACHITA MOUNTAINS,
Southern Forest Experiment Station, Fayetteville, Ark.
Thomas L. Rogerson.
USDA Forest Serv. Res. Note SO-117, 5 p., illus.

Descriptors: *Storm runoff, *Water yield, *Sediment yield, *Soil water, *Evapotranspiration, Precipitation, Peak discharge, Arkansas.
Identifiers: *Water timing, *Experimental watersheds, Alum Creek Experimental Forest.

Precipitation, runoff, and sediment losses were measured for 9 years and soil water for the last 3 years on three small forested catchments in the Ouachita Mountains of central Arkansas. Annual precipitation averaged 52.5 inches runoff 6.0 inches. Seventy-seven percent of the runoff occurred during the December-May periods when soil water was near maximum capacity. Annual sediment losses averaged 13.8 pounds per acre.
W71-12757

DROUGHT BIBLIOGRAPHY,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Environmental Data Service.
W. C. Palmer, and L. M. Denny.
National Oceanic and Atmospheric Administration Technical Memorandum EDS 20, June 1971. 236 p.

Descriptors: *Droughts, *Bibliographies, *Information retrieval, *Documentation, Publications, Hydrologic budget, Moisture deficit, Effects, Economics, Crop production, Soil erosion, Social impact, Abstracts, Agriculture, Extraterrestrial hydrology, Geographical regions, Libraries, Water shortage.
Identifiers: *Particular droughts, Historial droughts, Meteorological droughts.

Citations for 3,150 references on drought are presented that cover the scientific literature through 1968, probably the most comprehensive drought document compilation yet assembled. The bibliography was stimulated by the 1961-66 New England drought. Much literature (about one-third of the items in this report) deals with the consequences to special interests of prolonged dry weather periods. Therefore, the meteorological, agricultural, hydrologic, economic, and sociologic EEFECTS of drought are given as subject headings. The bibliography is arranged in five broad sections: General, Descriptions, Causes, Effects, and Countermeasures. Abstracts are given for about one-fourth of the references; they were taken mostly from Meteorological and Geoastrophysical Abstracts (MGA). Foreign titles and abstracts given were translated by MGA. When translations are

available for foreign-language documents this fact is noted. The automated indexing techniques used in the bibliography were pioneered by the American Meteorological Society. (Lang-USGS)
W71-12793

TEMPERATURE FLUCTUATIONS OF THE KARA SEA WATER DURING THE LAST DECADES,
A. O. Shpaykher, and Z. O. Fedorova.
Soviet Hydrology: Selected Papers, No 1, p 57-65, 1970. 2 fig, 6 tab, 20 ref. Translated from Problemy Arktiki i Antarktiki, No 33, p 13-22, 1970.

Descriptors: *Water temperature, *Arctic Ocean, *Climatology, Heat budget, Advection, Albedo, Sea ice, Climates, Temperature, Arctic, Ocean currents, Water circulation.
Identifiers: *Kara Sea, USSR.

Water temperature variations in the North Atlantic are associated primarily with the year-to-year and long-period fluctuations of the intensity of the Gulf Stream and of its continuation, the North Atlantic Current. The recent inflow of water, heat and salt into the Arctic Basin has diminished. Compared with the 1952-1956 period, in 1961-1965 the inflow of Atlantic water decreased 10.6%, that of heat 21.2%, and that of salt 12.3%. The decreased inflow of heat and salt into the Arctic Basin affected within approximately three years the temperature and salinity of deep water in the Kara Sea. An analysis of the structure of Arctic water clearly reveals that the change in salinity takes place in the 50- to 25-m layer, while the change in temperature becomes fairly distinct only at a depth of 50 m. It is precisely in the surface layer (5-25 m) that minimum water salinity was recorded in the 1962-1966 period. However, only one year later, the salinity minimum was observed at the depth of 75 m, and during the last five-year period of the decade in question, it was clearly defined at a depth of 100 m. During the last decade the ice thickness increased correspondingly in winter by 16 to 17 cm in the western part of the Kara Sea and by 12 to 14 cm in the eastern part. (Knapp-USGS)
W71-12818

OVERLAND FLOW ON AN INFILTRATING SURFACE,
Agricultural Research Service, Tucson, Ariz., Southwest Watershed Research Center.
For primary bibliographic entry see Field 02G.
W71-12829

HYDRAULIC MODELING OF FLOWS IN BODIES OF WATER (Gidravlicheskoye modelirovaniye techeniy v vodoyemakh),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12853

THE SEASONS: LIFE AND ITS RHYTHMS,
Anthony Smith.
318p. Illus. Maps. Harcourt Brace Jovanovich, Inc.: New York, N.Y., 1970. Pr. $12.50.
Identifiers: Animal, Biological, Birds, Book, Butterflies, Cataclysms, Clock, Early, Ferret, Hibernation, Human, Life, Man, Methods, Migration, Plant, Rhythms, Seasons, Survival.

This book, written for the student of general biology and ecology, takes as its theme the variety of plant and animal life and behavior resulting from the responses of life forms to the earth's daily rotations on its axis about the sun and its spin on that axis producing the seasons. The theme is treated in 3 main approaches: the physical effects of the earth's position and movement in the solar system; the variety of seasonal change in all the different regions of the earth; and the adaptive rhythms of animal and plant life including the 'biological clock.' Discussions include reference to the evolution of life forms under the influence of the perpetual cycles and such adaptive features as migration and hibernation, survival methods such as color change and complex breeding cycles and the thinking of earlier man reflected in his art and hunting habits. Initial chapters deal with the development of the calendar, the climates throughout the world and their annual cycles, the life cycle of the ferret as an example of the sun's influence on behavior and the basic rhythms of nature. Seasonal life on other planets is projected along with a discussion of seasonal changes throughout the history of the earth. Individual chapters then follow outlining life in polar climates, temperate clines and tropical areas. Two chapters then offer information on the place of cataclysms (floods, volcanic eruptions, tornados, etc.) in seasonal cycles and special areas in the world where climatic influences are minimal. The final discussions concern biological phenomena of a wide range of species influenced by the natural cycles: sexual cycles, migrations, hibernations, etc. Complementing the text is a collection of photographs including birds in hibernation, butterflies, the artic spring, the life of man in regions of permanent frost, earthquake, monsoon floods and many other seasonal activities on earth. Diagrams and maps in the text chart the worldwide phenomena for easy reference.--Copyright 1971, Biological Abstracts, Inc.
W71-13025

2B. Precipitation

RUNOFF GROUPING FOR DETECTION OF CHANGE IN RUNOFF,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W71-12250

HOURLY RAINFALL SYNTHESIS FOR A NETWORK,
Hydrocomp International, Palo Alto, Calif.
D. D. Franz.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, Paper 8375, p 1349-1366, September 1971. 4 fig, 7 tab, 37 ref, append. NSF Grant GK 1648.

Descriptors: *Synthetic hydrology, *Statistical models, *Rainfall-runoff relationships, *Simulated rainfall, Markov processes, Stochastic processes, Simulation analysis, Mathematical models, Peak discharge, Storm runoff.
Identifiers: Rainfall synthesis.

Generation of synthetic hourly rainfall data for a network is investigated because existing monthly streamflow models are inadequate and because watershed models are available to accurately predict streamflow given the hourly rainfall data in the watershed. The storm model was based on a multivariate Gaussian Markov process. A fractional power transformation normalized the rainfall probability distributions. Estimation of parameters was carried out by using a combination of nonlinear least squares and probability plotting. The model reproduced the characteristics of hourly rainfall data with reasonable accuracy. However, some deficiencies in covariance structure and seasonal distribution occurred. The distribution of peak flows and annual volumes for Dry Creek near Cloverdale, California derived from synthetic rainfall data compared favorably with the same values derived from historic rainfall data. (Knapp-USGS)
W71-12259

ON PARAMETERIZATION OF CONVECTIVE AND NONCONVECTIVE LATENT HEAT RELEASE,
Florida State Univ., Tallahassee. Dept. of Meteorology.
T. N. Krishnamurti, and W. J. Moxim.
Available from NTIS, Springfield, Va. 22151 No COM-71-00270 $3.00 printed copy; $0.95 microfiche. In: David W. Stuart and T. N. Krishnamurti, 'Specifications of Meso-Scale Weather From Large-Scale Dynamical Calculations,' Florida State University, Final Report No 70-5, May 1970. 27 p, 8 fig, 9 ref. ESSA Grant E22-64-68G.

Descriptors: *Precipitation (Atmospheric), *Storms, *Convection, *Latent heat, *Model studies, Mathematical models, Forecasting, Rainfall.

Precipitation from storms is estimated by mathematical models of parameterization of convective and nonconvective latent heat releases. A detailed heating function is designed for use in the omega-equation and primitive equation prediction models. This function permits stable or unstable heating to occur in a given region and also allows for the simultaneous occurrence of both kinds of heating in the same region. Precipitation rate estimates show major improvement over earlier versions which followed only stable heating. (Woodard-USGS)
W71-12273

BIBLIOGRAPHY ON ATMOSPHERIC (CYCLIC) SEA-SALTS,
Army Natick Labs., Natick, Mass. Earth Sciences Lab.
William B. Brierly.
Available as AD-718 613 from Nat. Tech. Inf. Service, Springfield, Va. - Price $3.00. Army Materiel Command, Natick Earth Sciences Laboratory Technical Report 70-63-ES, April 1970. 87 p.

Descriptors: *Bibliographies, *Sea water, *Meteoric water, *Atmosphere, *Hydrologic cycle, Evaporation, Movement, Documentations, Publications, Information retrieval, Air circulation, Ocean circulation, Evapotranspiration.
Identifiers: *Sea-salts cycle.

This bibliography provides more than 600 references covering all phases of the sea-salt cycle: the origin of the particles in salt lakes, playas, and oceans, the processes by which the salt particles are jetted into the air from sea and lake surfaces by bursting bubbles, their transport inland over the continental landmasses, their impingement, incrustment, and fallout either as dry salt particles or in various forms of precipitation and their eventual return in rivers to the sea. Selected references are also included on the historic development of the subject, methods of chemical analysis, and techniques of instrumentation and experimental research leading to the formulation of current theories and postulations. An Index to Subjects is included. Most of the current meteorological and geophysical journals as well as obscure sources of world-wide scope have been used in this compilation. (Woodard-USGS)
W71-12278

THE SAN JUAN ECOLOGY PROJECT, PHASE 1,
Colorado State Univ., Fort Collins.
J. D. Ives, H. E. Owen, and H. W. Steinhoff.
Available as PB-197 655 from Nat. Tech. Inf. Service, Springfield, Va. 22151--price $3.00; $0.95 microfiche. Teller, H. L. (editor), Colorado State University, Department of Watershed Services Report No CSU-DWS-6962, August 1970. 151 p, 23 fig, 5 tab, 31 ref, 5 append. Bur. of Reclam. Contract No. 14-06-D-6962.

Descriptors: *Cloud seeding, *Artificial precipitation, *Ecology, *Weather modification, *Colorado, Mountains, Snow, Reviews, Ecosystems, Forests, Project planning, Project purposes.

The evaluation of the ecological effects of increased snow which is anticipated from cloud seeding in the Upper Colorado River Pilot Project is presented. Included are a descriptive account of the ecological communities of the target area, the likely impact of increased snow on these communities, and priorities for the study plan. The San Juan

Mountains in the study area are essentially the product of intermittent domal uplifting. Mean annual precipitation varies from less than 20 to over 60 inches on the target area, 16% of which lies above 12,000 feet, 31% between 1,500 and 12,000 feet, and 53% below 10,500 feet. The target area generally lies above the 9,500 foot contour, where most snow increases are likely to occur. The biotic environment is described in terms of the distribution of major vegetation types on the target area, and by descriptions of producer, consumer and decomposer communities in the alpine, forest and aquatic ecosystems. (Woodard-USGS)
W71-12280

STUDIES OF THE ATMOSPHERIC WATER BALANCE,
Colorado State Univ., Ft. Collins. Dept. of Atmospheric Science.
J. L. Rasmussen, D. L. Hadley, R. W. Furman, and Lee K. Balick.
Available from the National Technical Information Service as PB-202 696, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Environmental Resources Center, Series No 24, Colorado State University, August 1971. 30 p, 14 fig, tab, 24 ref. OWRR Project B-035-COLO (3).

Descriptors: *Water balance, Cyclones, Air-earth interfaces, *Circulation, *Climatology, Hydrologic cycle, Meteorology, *Precipitation (Atmospheric), Colorado River basin.

The atmospheric water balance computation is used for two distinctly different kinds of applications in this paper. First, the atmospheric water balance is used to infer the exchange of water at the earths surface over the upper Colorado River Basin. Thirteen winter seasons (1957-1969) were studied, twelve-hourly computations were accumulated from November 1, through April 30 and the resulting seasonal accumulation of water was correlated to the succeeding twelve months discharge from the basin. The correlation between runoff and accumulation is r—0.54. The first seven years show a remarkably good correlation r—0.82. The final six years contain most of the scatter r—0.34. Recent evidence of systematic errors in the measurement of humidity are presented as a possible cause of this deterioration in correlation. The second application of the water balance technique was centered on the study of the precipitation mechanisms within large extratropical cyclone storm systems. The ratio of precipitation rate to condensation rate is shown to be 0.90 for two storm cases. The condensation is shown to be largely formed at quite warm temperatures (warmer than minus 10C). Finally, a very localized intense band of precipitation is investigated and a hypothesis presented that suggests the localized precipitation extreme is related to the dynamic effects of a low level wind configuration initiating convective activity.
W71-12329

SOME RESULTS OF SINGLE CLOUD PYROTECHNIC SEEDING IN FLORIDA, 1970,
Atlantic Oceanographic and Meteorological Labs., Miami, Fla., Experimental Meteorology Lab.
For primary bibliographic entry see Field 03B.
W71-12418

A CONTRIBUTION TO THE OBJECTIVE ASSESSMENT OF AREAL RAINFALL AMOUNTS,
Institute of Hydrology, Wallingford (England).
A. N. Mandeville, and J. C. Rodda.
In: Wellington Symposium - The Results of Research on Representative and Experimental Basins; December 1-8, 1970, New Zealand: New Zealand Journal of Hydrology, Vol 9, No 2, p 281-291, 1970. 11 p, 3 fig, 4 tab, 25 ref.

Descriptors: *Rain gages, *Statistical methods, *Depth-area-duration analysis, *Distribution patterns, Small watersheds, Rainfall disposition, Isohyets.
Identifiers: *Trend surface analysis, *Experimental watersheds.

The application of trend surface analysis to the assessment of the mean basin rainfall is discussed and results obtained by that method are compared with those determined by the more traditional approach. The method was applied to records from two standard rain gage networks in representative basins in contrasting parts of the United Kingdom. The River Ray catchment at Grendon Underwood is flat and dry by comparison with the basin of the River Rheidol, which is characterized by large amounts of rain and considerable relief. A remarkably high percentage of the variance on the Rheidol watershed was accounted for; the figure of 95% was exceeded in three cases. In contrast, the fit of the surfaces was less successful in the Ray, even when the daily falls were grouped according to the origin of the rain. Corrections for rain gage errors could cause substantial alteration to patterns of rainfall distribution, especially in areas like the Rheidol. In fact, records from some gages for some of the months suggested that highly anomalous readings were responsible for the poor fit of the trend surface. Several trials were made omitting the suspect gages; the amount of variance accounted for was increased and the mean basin rainfall estimate was made to agree more closely with other estimates. (Knapp-USGS)
W71-12427

ECOLOGICAL STUDY OF FUMARIA VAILLANTII LOIS.: II. INFLUENCE OF CLIMATOLOGICAL FACTORS ON ITS GERMINATION AND VEGETATION IN LANGUEDOC,
For primary bibliographic entry see Field 02I.
W71-12521

ON AIR-SEA INTERACTION IN THE KII CHANNEL,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
For primary bibliographic entry see Field 02E.
W71-12628

LONG-PERIOD VARIATIONS IN THE OCEAN-ATMOSPHERE SYSTEM,
Gidrometeorologicheskii Institut, Leningrad (USSR).
M. A. Valerianova, and Ye. I. Seryakov.
Oceanology, Vol 10, No 5, p 590-596, 1970. 7 p, 2 fig, 1 tab, 4 ref.

Descriptors: *Meteorology, *Climatology, *Heat budget, *Ocean circulation, *Atmospheric physics, Winds, Synoptic analysis, Water temperature, Weather forecasting.
Identifiers: *Ocean-atmosphere interactions.

The long-period variations of atmospheric circulation, the heat budget characteristics, and water temperature in the North Atlantic were analyzed. The main types of distributions of the average monthly pressure fields, heat exchange components, and water temperature in the surface layer were determined. Diffrent types of atmospheric circulation correspond to quite definite fields of heat exchange components and water temperature. The possibility of using these patterns for qualitative forecasts of the thermal state in various regions of the North Atlantic is established. (Knapp-USGS)
W71-12652

ANNUAL AND SEASONAL RAINFALL IN FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W71-12666

DIURNAL INCIDENCE OF RAIN AND THUNDER AT ASMARA AND ADDIS ABABA, ETHIOPIA,
Anti-Locust Research Centre, London (England).
D. E. Pedgley.
Meteorological Magazine, Vol 100, No 1184, p 66-71, March 1971. 1 fig, 2 tab, 5 ref.

Descriptors: *Rainfall, *Thunderstorms, *Diurnal, *Semiarid climate, *Convection, Climatic data, Seasonal, Circulation.
Identifiers: *Ethiopia, *Anabatic circulation, *Insolation.

Evidence exists indicating that a large-scale circulation, set up each day over the Ethiopian plateau, is able to inhibit afternoon convection over the Nile plains of the Sudan. The existence of such a circulation would imply a corresponding promotion of rainfall over the plateau. Diurnal variations of rainfall and thunder in Asmara and Addis Ababa were analyzed on a monthly basis for a 5-yr period (1958-1962). Conventional data were used for 8 three-hourly periods. Afternoon peaks of both rainfall and thunder coincided in both places, indicating the dominance of daytime convection on precipitation development. Additionally, Addis Ababa experiences persistent non-thundery rains after midnight from stratiform clouds. This together with supportive evidence from the Nile plains, indicates that, apart from the obvious effects of insolation on the diurnal incidence of rain and thunder, a broad-scale anabatic circulation develops between the Nile plains and the Ethiopian highland. (Casey-Arizona)
W71-12737

DROUGHT BIBLIOGRAPHY,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Environmental Data Service.
For primary bibliographic entry see Field 02A.
W71-12793

METEOROLOGICAL STUDIES IN RELATION TO CLOUD SEEDING EXPERIMENTS OVER SOUTH FLORIDA IN 1970,
Miami Univ., Coral Gables, Fla. Rosenstiel School of Marine and Atmospheric Science.
J. J. Fernandez-Partagas.
Miami University, Rosentiel School of Marine and Atmospheric Science Final Report, 1971. 71 p, 11 fig, 1 tab, 4 ref. NOAA Grant E-22-71-70 (G).

Descriptors: *Cloud seeding, *Meteorology, *Florida, *Rainfall, Analytical techniques, Hydrologic data, Data collections, Radar, Aerial photography, Synoptic analysis.
Identifiers: *Meteorological study.

The circulation, synoptic features and large-scale rainfall patterns which were observed during the cloud seeding experiments over south Florida in 1970 are described. Two different seeding operations were conducted: one during the month of May and the other from June to July 19. The following types of meteorological analysis were used to depict the evolution of motion and weather features over Florida and vicinity: (a) Streamline analysis, to obtain a multiple-level representation of horizontal wind flow throughout the troposphere, (b) Satellite pictures, to estimate total cloud cover and observe cloud patterns and their degree of organization, (c) Radar hourly presentations, to evaluate the echo coverage time-evolution over areas of interest and (d) Daily rainfall data from reporting stations over central and south Florida. Dry weather conditions prevailed over south and central Florida for much of the month of May. However, heavy precipitation which fell on the last week of the month (May 24-31) was responsible for large positive rainfall anomalies over localized regions for the entire month. For the June 29-July 19, period, individual synoptic situations and rainfall patterns correlated quite well on a daily basis. Highly disturbed weather conditions were generally associated with troughs of low-pressure whereas essentially undisturbed modes were prevalent under marked anticyclonic patterns. (Woodard-USGS)
W71-12794

THE USE OF SNOW FENCES FOR SHIELDING PRECIPITATION GAGES,
Wyoming Univ., Laramie.
P. A. Rechard and L. W. Larson.
Paper 39th Annu Meet, West Snow Conf, Billings, Mont, Apr 1971. 25 p, 7 fig, 5 tab, 19 ref.

Descriptors: *Precipitation gages, *Wind velocity, Accuracy, Snowfall, Errors, *Precipitation (Atmospheric), Meteorology, Meteorological data, Eddies, Bibliographies, Measurement, *Site selection, Turbulence, *Snow gages, Shielding, Wind (Meteorology), *Meteorological instruments.
Identifiers: *Snow fences.

Measuring precipitation under all conditions is not as simple as placing a suitable container in the open to catch the precipitation, but is a difficult undertaking. Accurate measurement of true precipitation at a given point for all conditions has never been accomplished and probably never will be. The catch of precipitation gages is affected by many variables, the most important being wind. Wind velocity strongly influences gage catch, and a decrease in catch generally results from an increase in velocity. Results of investigating the possibility of shielding precipitation gages from adverse wind effects by using artificial wind barriers such as snow fences are reported. Preliminary data analysis indicates that: (1) under windy conditions, an unshielded precipitation gage will catch about one-third of the standard snowfall; (2) a gage with the orifice protected by an Alter shield or with site protection by a snow fence will catch about two-thirds of the standard; and (3) a gage with the orifice and site protected will catch about the equivalent snowfall of the standard. (USBR)
W71-12891

PROJECT SKYWATER: METEOROLOGY MEETS ECOLOGY,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 03B.
W71-12898

MAN-MADE CLIMATIC CHANGES,
Maryland Univ., College Park. Inst. of Fluid Dynamics and Applied Mathematics.
Helmut E. Landsberg.
Science, 170 (3964): 1265-1274. Illus. 1970.
Identifiers: Balance, Carbon, Climate, Climatic, DI, Man, Micro, Oxide, Radiation, Urbanization, Vapor, Water.

Natural climatic fluctuations, even those of recent years, cover a considerable range. They can be characterized as a 'noise' spectrum which masks possible global effects of man-caused increases of atmospheric CO2 and particulates. Local modifications, either deliberate or inadvertent, measurably affect the microclimate. Some artificial alterations of the microclimate are beneficial in agriculture. Among the unplanned effects, those produced by urbanization on local temperature and on wind field are quite pronounced. The influences on rainfall are still somewhat controversial, but effects may extend considerably beyond the confines of metropolitan areas. They are the result of water vapor released by human activity and of the influence of condensation and freezing nuclei produced in overabundance by motor vehicles and other combustion processes. Therefore it appears that on the local scale man-made influences on climate are substantial but that on the global scale natural forces still prevail. Obviously this should not lead to complacency. The potential for anthropogenic changes of climate on a larger and even a global scale is real. At this stage activation of an adequate worldwide monitoring system to permit early assessment of these changes is urgent. This statement applies particularly to the surveillance of atmospheric composition and radiation balance at sites remote from concentrations of population, which is now entirely inadequate. Man-made aerosols, because of their optical properties and possible influences on cloud and precipitation processes, may constitute a more acute problem than CO2. Many of their effects are promptly reversible; hence, one should strive for elimination at the source. Over longer intervals, energy added to the atmosphere by heat rejection and CO2 absorption remain matters of concern.--Copyright 1971, Biological Abstracts, Inc.
W71-13024

2C. Snow, Ice, and Frost

PALEOMAGNETIC CHRONOLOGY OF PLIOCENE--EARLY PLEISTOCENE CLIMATES AND THE PLIO-PLEISTOCENE BOUNDARY IN NEW ZEALAND,
Rhode Island Univ., Kingston. Graduate School of Oceanography; and Victoria Univ. (New Zealand). Dept. of Geology.
J. P. Kennett, and N. D. Watkins.
Science, Vol 171, No 3968, p 276-279, January 22, 1971. 4 p, 3 fig, 36 ref. NSF Grants GA 13092 and GA 27092.

Descriptors: *Glaciation, *Pleistocene epoch, *Quarternary period, *Paleoclimatology, Climates, Climatology, Polar regions, Glaciers, Ice, Meteorology, Bedrock, Stratigraphy, Cenozoic Era, Tertiary period, Marine geology, Sedimentation, Microbiology, Microorganisms, Temperature, Marine microorganisms, Protozoa.
Identifiers: *New Zealand, Pliocene epoch, Paleontology, *Foraminifera, Micropaleontology.

The possibility is discussed that the initial cooling date that ushered in the Pleistocene Glacial Epoch in the New Zealand area occurred at a much earlier time than is generally believed. A definite but gradual climatic cooling period began to take place earlier than the Pleistocene, thereby establishing the beginning of the Glacial Epoch in New Zealand well into the middle Pliocene. Biostratigraphic, paleoclimatic, and oxygen isotope studies tend to indicate that cold phases or climatic oscillations took place well before the Pleistocene. Geologic field work consisted in taking cores in 61 specific locations along the Makara and Mangaopari Rivers near where they join some 35 miles east of Wellington, N.Z. These cores represent a remarkably complete stratigraphic sequence of marine tertiary and quarternary strata which when studied on the basis of micro fossil evidence tends to support this Pre-Pleistocene, middle Pliocene temperature oscillation theory. (Glasby-USGS)
W71-12267

THE INFLUENCE OF CLAYS ON WATER AND ICE IN ROCK PORES, PART 1. QUANTITATIVE COLD DIFFERENTIAL THERMAL ANALYSIS,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Geology.
James R. Dunn, and Peter P. Hudec.
Available as PB-197 148 from Nat. Tech. Inf. Service, Springfield, Va. 22151, price $3.00 printed copy; $0.95 microfiche. New York State Department of Public Works, Bureau of Physical Research Report, February 1965. 14 p, 12 fig. N.Y. Dept. Public Wks. Research Contract No. H. C. 7402.

Descriptors: *Thermal properties, *Water, *Ice, *Rocks, *Pores, Analytical techniques, Clays, Hydrology, Thermometers, Groundwater, Model studies, Instrumentation, Laboratory tests.
Identifiers: Thermal analysis, Cold differential, Rock pores.

Unique quantitative cold differential thermal analysis (electrocalorimetric) equipment has been constructed at Rensselaer Polytechnic Institute for the purpose of studying one phase of the nature of water and ice in rock pores. The temperature of freezing, the heat of freezing and the nature of freezing water in rock can be systematically analyzed for the first time with this unit. The DTA (differential thermal analysis) equipment is capable of detecting the freezing of 0.001% water in an average 40 gram rock sample or a temperature differential of 0.001 degree C. The construction and calibration of the DTA equipment and correction for variations of heat or freezing water with number of degrees of supercooling and for variations of specific heat and conductivity are described in detail. Typical temperature differential traces are described and interpreted. (Woodard-USGS)
W71-12281

SNOW COVER AND WINTER SOIL TEMPERATURES AT ST. PAUL, MINNESOTA,
Minnesota Univ., Minneapolis. Water Resources Research Center.
Donald G. Baker.
Available from the National Technical Information Service as PB-202 625, $3.00 in paper copy, $0.95 in microfiche. Minnesota Water Resources Research Center, St. Paul, Bulletin 37, June 1971. 24 p, 7 fig, 4 tab, 5 ref. OWRR Project B-005-MINN (3).

Descriptors: *Soil temperature, *Snow cover, *Isotherms, Minnesota, Soil moisture, Soil, Vegetation, Thermocouples, Frost, Winter.
Identifiers: *Heating degree days, *Soil freezing rate, *Radiation regime, *Soil freezing depth, Soil thermal conditions, *St. Paul (Minn).

The objectives of this study of winter soil temperatures under a sod cover were to show the configuration of the soil isotherm patterns, in particular that of oC, and to determine which soil thermal characteristics can be estimated by the snow cover. The temperature data were obtained at the University of Minnesota Agricultural Experiment Station plots on the St. Paul Campus with copper-constantan thermocouples during the winters of 1961-62 through 1968-69. Based upon the depth and persistence of the snow cover there were in effect 3 kinds of winters: one with deep and persistent snow cover, one with very little snow cover and all other winters. There was a close relationship between the kinds of winters and the maximum depth to which the oC isotherm penetrated, and a fair relationship to the rate of movement of the oC isotherm into the soil. The combination of type of winter (snow depth and duration) with cumulative heating degree days proved to be a simple and effective means of predicting the maximum freezing depth. (Walton-Minnesota)
W71-12319

RATIONALIZATION OF A SNOW MEASUREMENT NETWORK,
For primary bibliographic entry see Field 07A.
W71-12394

METHOD OF MEASURING THE CORRECT VALUES OF SOLID ATMOSPHERIC PRECIPITATION,
L. R. Struzer.
Translated from Transactions of the Voyeykov Main Geophysical Observatory (Trudy GGO), No. 244, 1969, pp. 41-47. Soviet Hydrology: Selected Papers, No 6, p 560-565, 1969. 6 p, 3 fig, 3 tab, 8 ref.

Descriptors: *Precipitation gages, *Snowfall, *Calibrations, *Instrumentation, *Data processing, Analytical techniques, Winds, Variability, Temperature, Snow surveys.
Identifiers: USSR, Snow gages.

The amount of solid precipitation corrected for wind can be obtained by multiplying the measured amount by the wind coefficient for solid precipitation. The magnitude of the coefficient depends on wind velocity at the level of the precipitation gage receiver and on air temperature. The correction is readily simplified by constructing a graph (or table) of the function. Data of seven stations for 87 months were used to check the method. Experience with investigations of wind errors shows that about 150-200 station-months are required to obtain sufficiently reliable curves. Therefore, the

results obtained are preliminary. The effect of errors on the results of measurements decrease with the increasing amount of precipitation collected and with increasing time over which the precipitation sum is determined. (Knapp-USGS)
W71-12395

EXPERIMENTAL STUDIES OF RAINFALL RUNOFF FORMATION UNDER PERMAFROST CONDITIONS,
Gidrometeorologicheskii Institut, Odessa (USSR).
Ye. D. Gopchenko.
Translated from Meteorology, Climatology and Hydrology (Meteorologiya, klimatologiya i gidrologiya), No. 5, 1969, pp. 218-223. Soviet Hydrology: Selected Papers, No 6, p 589-592, 1969. 4 p, 2 fig, 2 tab, 2 ref.

Descriptors: *Rainfall-runoff relationships, *Permafrost, *Frozen ground, *Frozen soils, Infiltration, Overland flow, Thawing, Permeability, Antecedent precipitation, Soil moisture, Simulated rainfall, Model studies, On-site investigations, On-site tests.
Identifiers: *USSR.

The genetic approach to runoff determination requires establishing genetic runoff formation patterns. Most observations cover only the largest rivers, permitting analysis only of the resultant effect of several factors. A detailed analysis of runoff formation processes is possible only on the basis of data for small catchments. Experimental investigations were conducted in the basin of Sumginskiy brook and consisted of sprinkling plots measuring 1 X 1 m. The basin area of the brook is 0.72 sq km, of which 58% is occupied by swamps and 42% by forest. Near the brook channel, permafrost in the swamps was found directly under the moss layer, but upslope the depth of thawing gradually increased to 0.6-0.7 m at mid-slope. In open areas and in the forest, permafrost was found at 1.5 m or deeper. Rainfall depth needed to induce runoff ranged from 1.0 to 85 mm, depending on the original soil moisture content, location of the plots on the slope, the thickness of the moss cover, and rainfall intensity. The lowest initial losses were recorded on parts of the slope nearest to the brook channel that are occupied by swamps. The water delivery rate to the plots had practically no effect on initial losses from the swamps. The traveltime varies from 2 to 7 m/hr in the swamps and depends mainly on slope. The difference between the travetimes in the forest and waterlogged areas is strikingly small. This indicates that the filtration properties of the plant mat of bogs and of the forest litter are practically the same. (Knapp-USGS)
W71-12399

HYDROCHEMISTRY OF THE COAST OF EAST ANTARCTICA (PRAVDA COAST AREA), COMMUNICATION 1,
Gidrokhimicheskii Institut, Novocherkassk (USSR).
A. A. Matveyev.
Translated from Hydrochemical Materials (Gidrokhimicheskiye materialy), Vol. 50, 1969, pp. 3-15. Soviet Hydrology: Selected Papers, No 6, p 592-602, 1969. 11 p, 2 fig, 4 tab, 33 ref.

Descriptors: *Water chemistry, *Precipitation (Atmospheric), *Sampling, *Antarctic, Snow, Geochemistry, Water analysis, Chemical analysis, Cold regions, Chemistry of precipitation.
Identifiers: *USSR, *Antarctica.

One of the main tasks of hydrochemical research on the continent of Antarctica was to study the chemical composition of snow, ice and precipitation. To obtain more complete information on the chemistry of atmospheric and glacial waters with allowance for the effect of the climate and ice- and snow-free land areas on their composition, precipitation samples were collected at Oazis Station (between June and October 1958), as well as snow, meltwater and ice samples in the vicinity of Mirny and in all the areas of operation of the expedition on the coast. The samples were taken on the ice slope (to the 23-km mark to the south of Mirny), near the West Ice Shelf (at a point close to 66 deg S, 88 deg E), on the dome of Drygalski Island 90 km to the north of Mirny, and in several other coastal areas. In all, 140 samples were collected and analyzed in the chemical laboratory at Mirny during the Third Continental Soviet Antarctic Expedition. In 10 months of observation in 1958, the mineralization of individual precipitation samples at Mirny varied from 3.3 to 260.8 mg/liter. In 60% of all precipitation the sum of ions ranges from 5 to 20 mg/liter. (Knapp-USGS)
W71-12400

HYDROCHEMISTRY OF THE COAST OF EAST ANTARCTICA (PRAVDA COAST AREA), COMMUNICATION 2. VARIATIONS IN THE CHEMICAL COMPOSITION OF PRECIPITATION,
Gidrokhimicheskii Institut, Novocherkassk (USSR).
A. A. Matveyev.
Translated from Hydrochemical Materials (Gidrokhimicheskiye materialy), Vol. 50, 1969, pp. 16-37. Soviet Hydrology: Selected Papers, No 6, p 602-618, 1969. 17 p, 5 fig, 6 tab, 22 ref.

Descriptors: *Water chemistry, *Precipitation (Atmospheric), *Sampling, *Antarctic, Snow, Geochemistry, Water analysis, Chemical analysis, Cold regions, Chemistry of precipitation.
Identifiers: *USSR, *Antarctica.

The results of investigations during the IGY and after yielded extensive information on the structure, climate, and evolution of the snow and ice cover of the sixth continent. Completely new data were obtained in many scientific disciplines, including hydrochemistry. There is a definite relationship between the chemical composition of atmospheric precipitation over the continent and atmospheric circulation in the Antarctic. This is evidenced by data on the change in the mineralization of precipitation and the ratio of the ingredients in it during the passage of cyclones over the observation area. The average monthly mineralization of precipitation on the coast is associated with the position of the drift ice edge. The average monthly mineralization of coastal precipitation (according to 10 months of observation at Mirny) is close to 22 mg/liter. Cl and Na .. K predominate in the chemical composition. Sea salt particles play the major role in the formation of the chemical composition of snow in all parts of Antarctica. The differentiation of the initial composition of marine aerosols that occurs at the ocean--atmosphere boundary and in the atmosphere over the continent produces the observed differences in the composition of snow in its various climatic zones. (Knapp-USGS)
W71-12401

LOCAL SNOW DISTRIBUTION IS NOT A FUNCTION OF LOCAL TOPOGRAPHY UNDER CONTINUOUS TREE COVER,
Canadian Forestry Service, Edmonton (Alberta).
R. H. Swanson.
In: Wellington Symposium - The Results of Research on Representative and Experimental Basins; December 1-8, 1970, New Zealand: New Zealand Journal of Hydrology, Vol 9, No 2, p 292-298, 1970. 7 p, 2 fig, 2 tab, 2 ref.

Descriptors: *Snowpacks, *Snow management, *Distribution patterns, *Variability, Statistical methods, Groundwater recharge, Forest management, Water management (Applied), Forestry, Runoff, Snow cover, Snow surveys.
Identifiers: *Alberta (Canada), *Experimental watersheds.

Timber management to enhance water values is a desirable practice. Vast timbered areas, such as the Forest Reserves of Alberta, cannot be managed to too fine a degree under the present economic conditions. Therefore, general guidelines are proposed. The enhancement of local groundwater recharge systems through snow accumulation management is a desirable practice for the approximately 6,000 square miles of lodgepole pine and mixed aspen timber types of the Forest Reserve. This topographically and vegetatively uniform area is one of low surface-water discharge, but high importance in groundwater recharge. Results of snow measurements made in Deer Creek experimental basin suggest that topographic features do not influence snow distribution. Slope and crown closure are also nonsignificant. None of the usually measured topographic features are very useful in explaining snow accumulation variance. Local snow accumulation is not a function of local topography under a continuous vegetative cover, and general management guidelines can be drawn up without regard to topographic variables. (Knapp-USGS)
W71-12428

NEW METHODS OF MEASURING WATER EQUIVALENT OF SNOW PACK FOR AUTOMATIC RECORDING AT REMOTE MOUNTAIN LOCATIONS,
Idaho Univ., Moscow. Engineering Experiment Station.
C. C. Warnick, and V. E. Penton.
Journal of Hydrology, Vol 13, No 3, p 201-215, July 1971. 10 fig, 32 ref.

Descriptors: *Nuclear moisture meters, *Water equivalent, *Snow surveys, *Telemetry, *Instrumentation, Data transmission, Snowpacks, Water yield, Snow management, Runoff forecasting, Gamma rays, Radioactivity techniques, Electrical studies, Precipitation gages.
Identifiers: Snowpack gages.

In the past decade there have been several research efforts in the United States to develop a method of measuring the water equivalent (total water content) of a snow pack that will allow the automatic recording and transmission of the record from remote mountain locations. The methods include: (1) an electrical method utilizing capacitance properties of the snow between two electrically-insulated electrodes projecting up through the snow pack; (2) a radioisotope snow guage that utilizes the attenuation of gamma rays between a source positioned above the snow pack and a counting system at the snow-ground interface; and (3) a pressure pillow in which the change in pressure within a fluid-filled flat pillow reflects the weight of the snow directly above the pillow. The accuracy of the gauges is discussed as well as the location of use and experimentation, and the method of recording and transmitting the record. The object has been to improve on the system of manual measurements hitherto employed. (Knapp-USGS).
W71-12460

THE ORIGIN OF MASSIVE ICY BEDS IN PERMAFROST, WESTERN ARCTIC COAST, CANADA,
British Columbia Univ., Vancouver. Dept of Geography.
J. Ross Mackay.
Canadian Journal of Earth Sciences, Vol 8, No 4, p 397-422, April 1971. 21 fig, 8 tab, 58 ref.

Descriptors: *Permafrost, *Ice, *Arctic, Frozen ground, Frozen soils, Water sources, Cold regions, Soil mechanics, Crystallization, Freezing, Pore pressure, Soil water movement.
Identifiers: *Ice lenses.

Massive beds of ground ice exist along the arctic coastal plain east of the Alaska-Yukon boundary for a distance of at least 500 km. The massive gound ice can be seen in both undisturbed and glacially disturbed Pleistocene sediments. An examination of several thousand seismic shot hole logs, from drill holes of 15 to 35 m in depth, also corroborates the widespread occurrence of ground ice. The icy beds typically have an ice content, defined in terms of the weight of ice to dry soil, in excess of 200% for sections as much as 35 m thick. A theory is presented which suggests that: the ice is

of segregation origin; the source of excess water is from the expulsion of groundwater during the freezing of sands; and high pore water pressures, favorable to ice segregation, developed beneath an aggrading impermeable permafrost cover. Permafrost aggradation may have occured either on an exposed sea floor during a period of sea level lowering which would have accompanied a glacier advance, or following a warm interval in which there had been deep thaw. Similarities in the origin of pingo ice and massive ice are discussed. (Knapp-USGS)
W71-12464

AMBIGUOUS 'GLACIAL' STRIAE FORMED NEAR WATERBODIES,
Waterloo Univ. (Ontario). Dept. of Geography.
A. G. McLellan.
Canadian Journal of Earth Sciences, Vol 8, No 4, p 477-479, April 1971. 3 fig, 8 ref.

Descriptors: *Scour, *Ice, *Erosion, *Iced lakes, *Lake ice, Beach erosion, Cryology, Geomorphology, Sedimentary structures.
Identifiers: Ice ramparts, Lake ice striae.

Striations indistinguishable from glacial striations are formed by boulders pushed shorewards by lake ice. Thus striations alone do not provide unequivocal evidence for the direction of movement of continental ice sheets. These striations cannot be distinguished from true glacial striations. Chattermarks and curvilinear striations formed by boulders can also be found. The striations appear to radiate from the center of the widest adjacent stretch of water, as do the troughs behind the ice push boulders, except on a few small islands where they and the troughs radiate on all directions. On some rough bedrock surfaces the striations of the 'icepush' boulders are no more than ephemeral chalky scratches. The different degrees of incision of the striations suggest differences in pressure, and thus that there may be more than one mechanism whereby ice-push effects can be produced. (Knapp-USGS)
W71-12466

VEGETATIONAL PATTERN NEAR ALPINE TIMBERLINE AS AFFECTED BY FIRE-SNOW-DRIFT INTERACTIONS,
Duke Univ., Durham, N.C. Dept. of Botany.
For primary bibliographic entry see Field 04C.
W71-12514

PARTICLE SIZE SORTING OF PROGLACIAL EOLIAN MATERIALS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
D. P. Franzmeier.
Soil Sci Soc Amer Proc. 34 (6): 920-924. Illus. Map. 1970.
Identifiers: Dunes, Eolian, Glacial, Loess, Materials, Particle, Pro, Size, Sorting.

A theory that there is a critical size separating particles moved by saltation from those carried in suspension was tested in proglacial deposits near the Wabash and White Rivers in Indiana. Here the westerly winds of glacial times piled the sand by saltation into a band of dunes and carried the silt in suspension and deposited it as loess east of the dunes. Soil C horizons were sampled in transects across the dune and loess belts of both areas and were analyzed for particle size using narrow size intervals. In both areas a zone between 40 micro and 80 micro diameter separates dune sand from loess. Between these limits the dune sands and loess are more than 94% exclusive of each other. Glacial till that is representative of the source of outwash, which, in turn, is the source of the eolian deposits, contains much 40 to 80 micro material. This size fraction, however, is practically missing from both the dunes and the loess. Apparently this fraction was selectively removed by wind or by water and deposited elsewhere.--Copyright 1971, Biological Abstracts, Inc.
W71-12575

METHODS FOR STUDYING FROZEN PEAT AND MINERAL SOILS OF THE KARELIAN ASSR (Metody issledovaniy promerzayushchikh torfyanykh i mineral'nykh pochvogruntov Karel'skoy ASSR),
Akademiya Nauk SSSR, Petrozavodsk. Karelskii Filial.
I. M. Nesterenko.
Meteorologiya i Gidrologiya, No 3, p 58-64, March 1971. 4 fig, 1 tab, 5 ref.

Descriptors: *Frozen soils, *Peat, *Permafrost, *Soil physical properties, *Freezing, Cold regions, Frozen ground, Thawing, Infiltration, Bulk density, Moisture content, Water yield, Seasonal, Cores, Core drilling, Sampling, Instrumentation.
Identifiers: *USSR, Karelian ASSR, Mineral soils, Moisture capacity, Ice drills, Permafrost recording gages, Depth of freezing.

The absence of strict mathematical relationships between water-physical properties of soils during their freezing is largely the result of a combination of two factors: (1) the regorous conditions of winter field work; and (2) the inadequacy of present-day instrument performance. To study the processes occurring in soils during their freezing and thawing, investigations were made of several water-physical properties of frozen peat and mineral soils of the Karelian ASSR. The soil properties examined included bulk density, moisture content, water yield, the coefficient of infiltration and the depth of freezing. Graphs constructed for determining the bulk density and moisture content of frozen soils in percent by volume made it possible to facilitate and refine water balance estimates for a winter period. Three instruments used to study frozen soils were described: (1) a fisherman's ice drill for sampling the moisture content of frozen peat and clay soils; (2) a circular ice drill for obtaining core samples of frozen peat and clay soils with an undisturbed structure; and (3) a permafrost recording gage for recording the freezing depth of water in a tube. The methods and instruments reviewed will contribute to a better understanding of the character of moisture redistribution in upper soil layers and to development of improved techniques for controlling undesirable processes in soils. (Josefson-USGS)
W71-12610

THE MEIGHEN ICE CAP, ARCTIC CANADA: ACCUMULATION, ABLATION AND FLOW,
Department of Energy, Mines and Resources, Ottawa (Ontario). Polar Continental Shelf Project.
W. S. B. Patterson.
Journal of Glaciology, Vol 8, No 54, p 341-352, October 1969. 4 fig, 7 tab, 18 ref.

Descriptors: *Glaciers, *Regimen, *Movement, Ablation, Snowfall, Statistical methods, Water balance, Topography, Arctic, Surveys.
Identifiers: Meighen Ice Cap (Canada).

Accumulation on the Meighen Ice Cap appears to be about normal for the region, but ablation seems abnormally low. Statistical analyses of several years' data reveal the following trends: accumulation increases towards the north; ablation decreases with increase of elevation, decreases towards the north and west, and is greater on south-facing slopes than elsewhere. Because ice movement is very small, these trends explain the surface topography of the ice cap quite well. Other topics discussed are the significance of changes in the margins of a stagnant ice cap, and the rate at which net mass balance changes with elevation. (Knapp-USGS)
W71-12622

AREAL SNOW COVER AND DEPOSITION OF SNOWMELT RUNOFF IN CENTRAL COLORADO,
Forest Service, Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
Charles F. Leaf.
Forest Service Research Paper RM-66, March 1971. 19 p, 16 fig, 9 tab, 21 ref.

Descriptors: *Water yield, *Snowmelt, *Snow cover, *Forest management, *Lumbering, Clear-cutting, Water management (Applied), Water supply, Water conservation, Water balance, Runoff forecasting.
Identifiers: *Experimental watersheds, Fraser Experimental Forest (Colo).

Areal snow-cover depletion and resultant snowmelt and water yield were studied on three small watersheds in the Fraser Experimental Forest. High water yield efficiencies were observed on two watersheds which had: (1) almost complete snow cover when seasonal snowmelt rates on all major aspects were maximum; (2) a delayed and short snow-cover depletion season; and (3) moderate recharge and evapotranspiration losses. Water yield efficiency in one watershed with low-elevation south slopes was least. In 1969, streamflow from the drainage area on this basin below 9,850 feet was less than 30 percent of that generated from above this elevation. Fourteen years of comparative streamflow indicated that water yields from the low-elevation subdrainage can vary from near zero in poor runoff years to a maximum during good years of about 50 percent of the flow generated from the high-elevation subdrainage. (Knapp-USGS)
W71-12624

BARIC 'POLAR TIDE' AND ITS INFLUENCE ON THE ICE CONDITIONS IN ARCTIC SEAS,
Arkticheskii I Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
Z. M. Gudkovich, E. I. Sarukhanyan, and N. P. Smirnov.
Oceanology, (USSR), Vol 10, No 3, p 324-332, December 1970. 9 p, 5 fig, 1 tab, 11 ref.

Descriptors: *Atmospheric physics, *Climatology, *Arctic, *Geophysics, *Sea ice, Weather, Temperature, Ocean circulation, Meteorology, Atmospheric pressure, Arctic Ocean.
Identifiers: Polar tide (Atmospheric).

The 14-month atmospheric pressure variation in the Arctic, produced by the nutation of the poles of the earth, is investigated. To explain the observed characteristics of this variation, a hypothesis is advanced according to which the nutational atmospheric pressure fluctuations are produced by the superposition of secondary waves on the primary circumpolar pressure wave. The secondary waves form under the influence of the baric, 'polar tide' on cyclonic activity in the source regions of cyclones. Analysis of the nutational fluctuations of pressure gradients in three major regions of the Arctic permits explanation of the relationships found earlier between ice and hydrologic conditions by the movement of the poles, and reveals several new patterns of this phenomenon. (Knapp-USGS)
W71-12633

IONIC COMPOSITION OF THE WATER UNDER ICE,
A. P. Tsurikova, and V. L. Tsurikov.
Oceanology (USSR), Vol 9, No 4, p 489-496, 1970. 8 p, 2 fig, 4 tab, 14 ref.

Descriptors: *Freezing, *Sea water, *Water circulation, *Water chemistry, *Aqueous solutions, Water properties, Ice, Salinity, Ions, Carbonates, Sodium, Calcium, Carbon dioxide, Chlorides, Thawing.

Based on the theoretical formulas which express the relationship between ionic composition and growth rate in sea ice, equations were derived to calculate the concentration of various ions under ice which has grown at various rates, assuming a known vertical circulation depth. These relationships were confirmed by observations in a pond in Rostov Province and were then used to calculate deviations from the norm in the composition of sea water having constant salinity. These deviations were found to be small, and any changes which they would produce in the freezing point, density or

electrical conductivity of the water would be negligible. Recommendations are made for the organization of measurements in the sea and for further experimental work on this problem. (Knapp-USGS)
W71-12641

MOVEMENT MEASUREMENTS ON TWO ROCK GLACIERS IN THE EASTERN ELK MOUNTAINS, COLORADO,
Geological Survey, Denver, Colo.
B. Bryant.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B108-B116, 1971. 9 fig, 1 tab, 9 ref.

Descriptors: *Rock glaciers, *Movement, *Colorado, Glaciers, Surveys, Mass wasting, Ice, Mapping, Profiles, Geomorphology, Erosion, Sediment transport.
Identifiers: Elk Mountains (Colo).

On two cirque rock glaciers at 11,500-12,000 feet in altitude at lat 39 deg 00 sec N. in the eastern Elk Mountains of Colorado, maximum surface movement amounted to about 2 feet (60 cm) per year over a 4-year period. Practically no disruption of their surface cover took place during that period, and little change along surface profiles was detected. In both rock glaciers there appeared to be a lateral component of movement away from the highest valley wall. Movement oblique to the rock-glacier axes indicates that direction of rock-glacier movement may be influenced by the amount of rock supplied by rockfall and avalanche, which was much greater on the south side than on the north side of the Maroon rock glacier. Glacial ice is exposed less than 1 meter below the surface of Arapaho rock glacier 1,300 feet (400 m) downvalley from the base of the cirque headwall; however, movement rates there were only 20 cm/yr. No direct obsn the eastern Elk Mountains show whether the rock glaciers consist of glacial ice mantled with debris, or have a smaller core of glacial ice (as revealed by a mine tunnel in one rock glacier in the San Juan Mountains of southwestern Colorado), or have only interstitial ice. Because of differences in morphology, altitude, and physiographic setting it is likely that all three types occur in the eastern Elk Mountains and that there are intergradations among them. (Knapp-USGS)
W71-12670

THERMAL INFRARED DETECTION OF GLACIAL GRAVEL, YELLOWSTONE NATIONAL PARK, WYOMING,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07B.
W71-12672

RIVER ICEBREAKER: CONCEPT DESIGN AND TESTING.
CONSULTEC, Inc., Rockville, Md.

Available from the National Technical Information Service as AD-723 333, $3.00 in paper copy, $0.95 in microfiche. Coastguard Contract report, February 1971, 117 p. DOT-CG-03918-A.

Descriptors: *Ice breakup, *Ice jams, *Mathematical models, Costs, Navigation, Pressure, Test procedures.
Identifiers: *Icebreakers, Coast Guard research, Ship hulls, *River icebreakers.

This document describes the conceptual design and testing of a unique icebreaking vessel. The hull form is developed around 'least energy' ice handling techniques and a model testing program is conducted to optimize the concept. A math model of the ice handling principle is presented to support the testing program. Ice cutters are designed utilizing the water cannon principle. The performance and characteristics of the water cannon are developed. Underwater jets are investigated for flushing the broken ice away from the channel edge. Life cycle costs are presented for a river icebreaker system. Naval architecture studies and machinery selection complete the design package.
W71-12706

LOCATING SNOW FENCES IN MOUNTAINOUS TERRAIN,
Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
R. A. Schmidt, Jr.
In Snow removal and ice control research. Highw. Res. Bd. Spec. Rep. 115, 282 p. 1970. 220-225. (Proc. of an Int. Symp. April 8-10, 1970, Dartmouth College, Hanover NH).

Descriptors: Snow, *Snow management, *Snowpacks, *Structures, Control structures, Meteorology, Watershed management, Colorado.
Identifiers: Snowdrifts.

Cross-sectional profiles of the snowdrifts show that an upslope approach to the fence causes a short, high drift to form compared to the long shallow drift formed with a downslope approach. Locating fences for maximum effectiveness in irregular terrain is complicated by the need to maintain a gap between the fence and ground throughout the snow season.
W71-12755

WINTER REGIME OF RIVERS AND LAKES,
Cold Regions Research and Engineering Lab. Hanover, N.H.
Bernard Michel.
Cold Regions Research and Engineering Laboratory Science and Engineering Monograph III-B1a, April 1971. 130 p, 104 fig, 6 tab, 164 ref.

Descriptors: *Ice, *Iced lakes, *Ice jams, *Ice breakup, Cold regions, Melting, Rivers, Ice-water interfaces, Intakes, Frazil ice, Lakes, Streams.
Identifiers: *Ice control, *Ice forecasting.

Present methods of river and lake ice surveys and knowledge of heat balance of water bodies in winter, frazil ice, ice cover formation, breakup, and ice control are reviewed. A classification for river and lake ice is presented, based on gross macroscopic characteristics and history, but which is not related to the texture and internal structure of the ice itself. Qualitative observations of the formation, evolution, and breakup of an ice cover can be made by visual observations along the bank of a river or lake or by aerial observations and photographs. Because ice phenomena have a strong tendency to repeat themselves at the same location, a few general surveys will readily show the most advantageous overall plan for any development under consideration. On large watercourses or lakes, the ice survey has to be made from the air and pictures taken to cover the whole water body. One of the most important tasks in winter surveys for rivers is water level measurement and streamflow gaging. Breakup is characterized by the formation of ice jams, and numerous icy floods have been recorded. Water-level rises of more than 20 ft are common when an ice jam is formed. In a river breakup, two processes are happening at completely different rates. One is the slow process of weakening and fracturing of the ice cover along the river course and the other is the general movement of the ice cover. Dangerous ice jams at breakup can be completely eliminated or controlled by adequate engineering works, and ice control methods are available to help keep intakes clear of river ice. (Knapp-USGS)
W71-12792

MATHEMATICAL SIMULATION OF DISPERSION OF POLLUTANTS IN A LAKE WITH ICE COVER,
Calgary Univ. (Alberta). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W71-12797

EFFECT OF FAST ICE ON ICE DRIFT,
A. Ya. Nikolayeva.
Soviet Hydrology: Selected Papers, No 1, p 65-68, 1970. 2 fig, 5 ref. Translated from Problemy Arktiki i Antarktiki, No 33, p 110-114, 1970.

Descriptors: *Sea ice, *Ocean Currents, *Drifting (Aquatic), Currents (Water), Artic, Winds, Coasts, Arctic Ocean.
Identifiers: *USSR, Ice drift.

In the absence of currents, ice drift at a distance from the coast depends mainly on the wind. A coast, or fast ice, may have a very distorting effect on ice drift under certain conditions. The magnitude of the drift component normal to the coast depends not only on the distance from it, and the ice concentration; but also on ice thickness in the pack, its strength, and the presence of young ice in the coastal zone. (Knapp-USGS)
W71-12819

SNOW FENCE SHIELDING OF PRECIPITATION GAGES,
Wyoming Univ., Laramie. Water Resources Research Inst.
P. A. Rechard, and L. W. Larson.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, Paper 8386, p 1427-1439, September 1971. 9 fig, 1 tab, 8 ref. NOAA E-149-69 (N).

Descriptors: *Precipitation gages, *Snow, Calibrations, Instrumentation, Snow management, Streamflow forecasting, Wyoming, Equipment, Gaging stations, Snowfall, Snow surveys, Rain gages.
Identifiers: Snow gages, Snow fences.

Wind is a major source of error in the measured catch by precipitation gages. The generally used Alter or Nipher shields improve the characteristics of the gage to catch precipitation in wind. However, they do not provide all of the protection desired, especially for snow. A study was undertaken by the Wyoming Water Resources Research Institute to investigate the possibilities of shielding the entire gage with snow fencing. The study was conducted on the Pole Mountain Division of the Medicine Bow National Forest near Laramie, Wyoming, at an elevation of 8,200 ft. An unshielded precipitation gage catches about one-third of the defined standard. A gage which is shielded by either snow fences or an Alter shield catches approximately two-thirds, and gages shielded with both an Alter shield and snow fence catch the equivalent of the standard. (Knapp-USGS)
W71-12837

2D. Evaporation and Transpiration

SOIL WATER EVAPORATION: REDUCTION BY SIMULATED TILLAGE,
Agricultural Research Service, Mandan, N.D. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 03B.
W71-12266

EVAPORATION FROM WATER STORAGES.
Australian Water Resources Council, Canberra.

Australian Water Resources Council Hydrological Series No 4, 1970. 81 p, 8 fig, 7 tab, 469 ref.

Descriptors: *Evaporation, *Energy budget, *Instrumentation, *Meteorology, Temperature, Evaporation pans, Solar radiation, Water balance, Reservoirs, Lakes, Water storage, Hydrologic budget.
Identifiers: Australia.

By making appropriate routine meteorological measurements the evaporation from an existing lake can be evaluated over periods of a month or even less by any of the following methods: (a) Bulk aerodynamic method. This is the simplest proven

method and the logical choice for general routine operation. (b) Heat budget method. This requires somewhat elaborate instrumentation. (c) Pan conversion method. This is the simplest of these three methods but its appropriateness for general application has not yet been conclusively established. Under favorable conditions, which are rare, the water budget method may be the best method for estimating evaporation. An additional benefit of this method is that it provides estimates of the total loss of evaporation plus seepage. There is a large range in the value of the simple lake to pan coefficient due to climatic, seasonal, instrumental and observational factors and this militates against the general use of the simple pan coefficient method. The method can, however, provide a useful first approximation of annual lake evaporation and is applicable in the prediction of evaporation from proposed storages. Estimates both before and after the establishment of a water storage can be made from climatological data using a choice of several versions of the Penman approach which combines the bulk aerodynamic and heat budget methods. Pan evaporimeters used in estimating lake evaporation must be set up in the same climatic zone and in relation to the lake so that the evaporimeter is not in air modified by lake evaporation. distance from the lake is not critical on the upwind side. On the downward side, in the absence of definite information regarding the critical distance, a site at half the lake width from the lake, should be adequate. (Knapp-USGS)
W71-12276

TWELFTH PROGRESS REPORT OF THE HUMBOLDT RIVER RESEARCH PROJECT,
Nevada Dept. of Conservation and Natural Resources, Carson City. Div. of Forestry.
E. J. DeRicco, G. Zappettini, and O. M. Grosz.
Nevada Department of Conservation and Natural Resources, Division of Forestry Progress Report, April 1971. 26 p, 1 fig, 9 tab, 6 ref.

Descriptors: *Evapotranspiration, *Phreatophytes, *Nevada, Investigations, Data collections, Meteorological data, Evaporators, Evaporation pans, Methodology, Mathematical studies, Soil moisture.

Evapotranspiration data are presented for woody phreatophytes grown in plastic lined evapotranspiration tanks during the 1970 growing season as part of the Humboldt River Research project studies in Nevada. Evapotranspiration was measured in three saltcedar evapotranspiration tanks, three rabbitbrush tanks, and one greasewood tank. Climatic observations included recorded air temperature, relative humidity, and solar radiation, as well as daily maximum and minimum air temperature, 'Class A' pan evaporation, and total daily wind movement. The air temperature, relative humidity, and solar radiation data were used to compute monthly potential evapotranspiration. (Woodard-USGS)
W71-12282

INVESTIGATION OF SURFACE AND INTERNAL EVAPORATION ON HIGHMOOR BOGS,
O. A. Belotserkovskaya, I. F. Largin, and V. V. Romanov.
Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No. 177, 1969, pp. 16-38. Soviet Hydrology: Selected Papers, No 6, p 540-554, 1969. 15 p, 7 fig, 7 tab, 1 ref.

Descriptors: *Drying, *Evaporation, *Bogs, *Peat, Swamps, Mining, Water balance, Heat budget, Heat balance, Solar radiation, Temperature, Humidity, Water table, Ponds.
Identifiers: *USSR, *Peat mining, Peat bogs.

Evaporation from the bog surface and the transpiration of bog vegetation are the most important of all hydrophysical processes taking place in bogs. Total evaporation is the main loss for highmoor and 100% for lowmoor bogs. The heat losses by evaporation amount to 40-80% or more of the loss of the thermal balance of the bog surface. Total evaporation depends on the position of the groundwater level: on the average, evaporation from pools is 21-33% higher than that from ridges. A large portion of the vapor flow, especially in pools, is directed downward toward the groundwater level, where it condenses, instead of upward into the atmosphere. In peat mining fields, when the cut peat is turned once at 9:30 a.m. or 10 a.m., the rate of drying drops sharply toward noon: turning the peat a second time at 1 p.m. or 1:30 p.m. increases the evaporation rate by a factor of 1.5. The amount of moisture condensed at night on a peat mining field is 1.5 times greater than in a control area that is not cut. In an area where the cut peat is left overnight condensed moisture amounts, on the average, to 35-50% of the moisture evaporated during the daytime. (Knapp-USGS)
W71-12393

FORMULA FOR COMPUTING EVAPORATION WITH ALLOWANCE FOR THE TEMPERATURE OF THE FREE WATER SURFACE,
L. G. Shulyakovskiy.
Translated from Transactions of the Hydrometeorological Scientific Research Center of the USSR, (Trudy GMTs), No. 53, 1969, pp. 3-13. Soviet Hydrology: Selected Papers, No 6, p 566-573, 1969. 8 p, 1 fig, 3 tab, 10 ref.

Descriptors: *Evaporation, *Convection, *Water temperature, Reservoir evaporation, Boundary processes, Evaporation plans, Mass transfer.
Identifiers: *USSR.

Evaporation from the water surface is proportional to the vapor pressure gradients in the air layer near the water and the rate of vertical air transport. In the formulas for computing evaporation, the vapor pressure gradient in the air layer near the water is normally described by the difference between the saturation vapor pressure in the air at the temperature of the evaporating surface and the actual vapor pressure at some height. The rate of vertical air transport is determined by the intensity of forced turbulent motion and the intensity of free convection. Free convection, produced by the unstable density stratification of the air over the water surface, is determined by the air temperature and humidity gradients. However, the temperature of the free water surface is lower than the temperature at a depth of 1-10 cm. The difference between the free surface temperature and the temperature at some depth depends on meteorological conditions and on the mixing of water, and may vary within broad limits. For intense heat transfer and weak mixing, the temperature of the free water surface may be several degrees lower than that at a depth of 1-10 cm. The relative underestimation of evaporation over individual time intervals may vary according to the difference between the water temperature at some depth and that of the free water surface. Formulas are derived for estimating free-convection values using measured or computed water-surface temperatures. (Knapp-USGS)
W71-12396

ROLE OF EVAPORATION IN THE MIGRATION OF SALTS INTO THE ATMOSPHERE,
Severo-Osetinskii Selskokhozyaistvenni Institut, Ordzhonikidze (USSR).
Ye. G. Nemeryuk.
Translated from Hydrochemical Materials (Gidrokhimicheskiye materialy), Vol. 50, 1969, pp. 38-46. Soviet Hydrology: Selected Papers, No 6, p 618-625, 1969. 8 p, 7 tab, 8 ref.

Descriptors: *Water chemistry, *Ion transport, *Evaporation, *Water vapor, Aqueous solutions, Saline water, Sea spray, Salinity, Salts, Chlorides, Bicarbonates, Sulfates, Sodium, Calcium, Magnesium, Meteoric water.
Identifiers: *USSR, *Salt migration (Atmospheric).

Evaporation is an important link in salt exchange through the atmosphere under natural conditions. The water vapor thus formed is not a distillate. The migration of salts with water vapor differs from the mechanism by which salts enter the atmosphere with sea spray and during eolian processes in that the salts are in a molecularly dispersed state, rather than in the form of aerosols. The reason for the migration of ions with water vapor is their hydration and apparently also exchange adsorption between the liquid and gaseous phases, by water vapor at the boundary on account of the equilibrium carbonate system. It is possible that because of exchange adsorption, hydrogen ions are better replaced by calcium and potassium than by other cations. Differential ion migration with vapor is observed during the evaporation of sea water. Bicarbonate, sulfate, calcium, and potassium ions migrate preferentially from sea water. The amount of ions migrating during evaporation from fresh water can be represented by the following decreasing series: HCO3, SO4, Cl and Ca, Na, K, Mg. (Knapp-USGS)
W71-12402

SAMPLING FOR DIRECT TRANSPIRATION ESTIMATES,
Canadian Forestry Service, Edmonton (Alberta).
R. H. Swanson.
In: Wellington Symposium - The Results of Research on Representative and Experimental Basins; December 1-8, 1970, New Zealand: New Zealand Journal of Hydrology, Vol 9, No 2, p 72-77, 1970. 6 p, 1 tab, 6 ref.

Descriptors: *Transpiration, *Sampling, *Forests, *Lodgepole pine trees, Data collections, Consumptive use, Water balance, Forest management, Hydrologic budget, Statistics, Statistical methods, Xylem, Translocation, Instrumentation.
Identifiers: *Experimental watersheds, Heat-pulse transpiration measurement.

Heat-pulse velocities are directly indicative of transpiration rate. The transpiration of individual trees or stands can be compared provided the heat-pulse velocity values are representative of and from comparable water-conducting xylem. The results of a pre-sample to determine the statistical sampling intensities necessary to obtain comparable heat-pulse velocity data from lodgepole pine showed that 10 trees would constitute an adequate sample in most instances. For length-of-transpiring-day comparisons, two trees would suffice. This number of samples can be easily handled by one man, with one instrument, on an hourly sampling sequence. (Knapp-USGS)
W71-12423

DRYLAND EVAPORATIVE FLUX IN A SUBHUMID CLIMATE: II. PLANT INFLUENCES,
Agricultural Research Service, Temple, Tex. Soil and Water Conservation Research Div.
Joe T. Ritchie, and Earl Burnett.
Agron J. 63 (1): 56-62. 1971.

Descriptors: *Cotton, *Arid lands, *Sorghum, *Plant physiology, *Soil-water-plant relationships.
Identifiers: Climate, Cotton-D, Dry, Dryland, Evaporation, Evaporative, Flux, Humid, Leaf, Plant, Production, Sorghum-M.

Seasonal variation in three plant factors and in evaporation rates were determined for dryland cotton and grain sorghum in central Texas. Plant factors measured were fractional ground cover, dry matter production, and leaf area index (LAI). When an adequate supply of soil water was available in the rhizosphere, plant factors influenced evaporation rates during most of the 1st half of the growing season until a 'threshold' canopy LAI (the minimum LAI necessary to obtain 90% of potential evaporation (Eo) from row crops when the soil evaporation (Es) is small) was obtained; it was approximately 2.7 for both crops. After the threshold canopy LAI was obtained, evaporation was practically independent of plant factors and equal to Eo, as estimated from daily net radiation, until soil water movement to plant roots began to limit

evaporation. Es strongly influenced the actual evaporation rates obtained when plant canopy LAIs were below 2.7. To evaluate the influence of plant factors on the resulting plant evaporation (Ep) independent of Es, it was necessary to attempt a rational separation of Es and Ep. Es was assumed to be equal to the net radiation equivalent of evaporation below the plant canopy when the soil surface was wet. After the soil surface dried sufficiently to limit water movement to the surface, Es was estimated from the measured soil water content near the surface, Ep was estimated using the measured evaporation and Es. The ratio Ep/Eo was found to be related to the LAI according to the equation Ep/Eo — -0.21 .. 0.70 LAI 1/2, 0.1 A or — LAI A or — 2.7. Ep is larger per unit of leaf area for smaller plants than for larger plants with LAIs approaching 2.7. Sensible heat originating over partially dry surface soil between plant rows was a significant source of the total energy contributing to Ep. The physiological stage of growth did not greatly influence the amount of energy used in evaporation as grain sorghum plants approached maturity when an adequate supply of soil water was available. The results imply a possibility for improving water-use efficiency of dryland crops by using higher plant populations and closer row spacings to decrease Es if the soil water supply and seasonal rainfall are adequate.--Copyright 1971, Biological Abstracts, Inc.
W71-12481

ENVIRONMENTAL FLUCTUATIONS ON SOUTH-FACING SLOPES IN THE SANTA CATALINA MOUNTAINS OF ARIZONA,
Arizona Univ., Tucson. Office of Arid Land Studies.
Edward F. Haase.
Ecology. 51 (6): 959-974. Illus, 1970.

Descriptors: *Solar radiation, *Soil moisture, *Arid lands, Fluctuation, Slopes, Temperature, Environmental effects, Vegetation.
Identifiers: Arizona, Santa-Catalina.

Solar radiation, evaporation, air- and soil-temperature extremes, soil moisture, and precipitation were measured on 4 aspects, (SSE, S, SSW, SW) of constant slope in the desert foothills of the Santa Catalina Mountains over a 1-yr period. The sequence of warmest and driest aspects based upon annual means was S, SSW, SW, SSE. The warmest and driest aspect may change with the environmental factor considered or the time of year. Drought extremes reached a high peak on the SW aspect during the arid spring, although during all other seasons the SW aspect had the mildest drought conditions. The warmest and driest aspect during the summer rainy season was SSE, during the winter rainy season it was S, and during the fall arid season S and SSW were nearly equal. Few significant differences were found throughout the year between S and SSW aspects. When vegetation and environment are considered, the warmest and driest aspect may also change with the species because plants may utilize different microenvironments at different seasons and vary in their response to similar environmental changes.--Copyright 1971, Biological Abstracts, Inc.
W71-12497

TIDAL INFLUENCE ON THE APPARENT TRANSPIRATIONAL RHYTHM OF THE WHITE MANGROVE,
University Coll., Durban (South Africa).
O. A. M. Lewis, and G. Naidoo.
S Afr J Sci. 66 (9): 268-270. Illus, 1970.

Descriptors: *Swamps, *Aquatic habitats, *Plant physiology, *Tidal effects, Tidal marshes, Transpiration, Phytometers.
Identifiers: Avicennia-Marina-D, Ganong potometer, Mangrove-D.

The effect of tidal inundation on the apparent transpirational rhythm of the White Mangrove (Avicennia marina (Forsk.) Vierk.), was investigated by a potometric (Ganong potometer) method. The apparent transpiration rate of this plant rises in the morning with increasing light intensity and decreasing relative humidity until a mid-morning maximum is attained. Thereafter a progressive decrease in rate takes place during the rest of the day, regardless of atmospheric conditions. Tidal inundation of the swamp after the mid-morning maximum results in an increase in apparent transpirational rate and the attainment of a 2nd maximum, indicating that the initial decrease in rate was probably caused by incipient wilting following excessive transpiration and consequent increased soil water tension.--Copyright 1971, Biological Abstracts, Inc.
W71-12511

MEASUREMENT OF TRANSPIRATION IN TROPICAL TREES WITH TRITIATED WATER,
Argonne National Lab., Ill. Radiological Physics Div.
J. R. Kline, J. R. Martin, C. F. Jordan, and J. J. Koranda.
Ecology. 51 (6): 1068-1073. Illus, 1970.

Descriptors: *Transpiration, *Trees, *Tropical regions, *Plant physiology, *Tracers, Measurement, Radio isotopes.
Identifiers: Tritiated water, Water.

The measurement of transpiration of water by trees in the field with tritiated water as a tracer depends upon a new application of established theory of radionuclide dynamics in steady-state systems. The techniques required are non-destructive to the trees and probably have negligible disturbing effects on transpiration. Average transpiration rates ranging from 1.75 to 372 l/day/tree were measured by the proposed method on tropical forest trees which ranged from the understory to the canopy in size. Statistical errors range from 12.1% on the largest tree to 6.2% on the smallest for one standard deviation. Non-random sources of error in the method may include loss of tritium from leaves due to rainfall; and possible enrichment of tritiated water in leaves due to differences in vapor pressure and molecular diffusion coefficients between tritiated water and ordinary water. These require further experimental evaluation. The method may be generally applicable to field measurements of transpiration in trees.--Copyright 1971, Biological Abstracts, Inc.
W71-12512

A CLASSIFICATION OF EAST AFRICAN RANGELAND: II. THE WATER BALANCE AS A GUIDE TO SITE POTENTIAL,
University of Strathclyde, Glasgow (Scotland). Dept. of Applied Physics.
T. Woodhead.
J Appl Ecol. 7 (3): 647-652. Illus, Map, 1970.
Identifiers: African, Balance, Classification, East, Guide, Kenya, Method, Penman, Potential, Rangeland, Site, Transpiration, Water.

An annual index of water availability, expressing the amount of mean total precipitation which is available for transpiration by plants as a percentage of the annual total of potential evaporation from an open water surface, estimated by the method of Penman, is defined and mapped for Kenya. Allowance is made, according to soil depth and type, for storage of water within root range in the profile; the limitations of the data are discussed. This climatic index corresponds generally with the ecological classification of Pratt et al.--Copyright 1971, Biological Abstracts, Inc.
W71-12518

A SIMPLE TRANSDUCER METHOD FOR THE MEASUREMENT OF MILLIMETER CHANGES IN WATER LEVEL,
Aberdeen Univ. (Scotland). Dept. of Soil Sciences.
J. R. H. Coutts.
Journal of Soil Science, Vol 22, No 2, p 250-253, June 1971. 2 fig, 3 ref.

Descriptors: *Evaporation, *Instrumentation, Telemetry, Calibrations, Water levels, Evaporation pans.
Identifiers: *Evaporimeters.

A description is given of a transducer-float system for the measurement of small changes in water level in an evaporimeter tank. Readings can be recorded continuously, or at intervals. When in use in the field, the float is immersed in a stilling tank (surface area 360 sq cm), which is enclosed in a protecting box and connected by a metal tube to the evaporimeter. (Knapp-USGS)
W71-12586

RELATIONSHIP BETWEEN PLANT HEIGHT AND TRANSPIRATION IN COTTON (GOSSYPIUM HIRSUTUM L.),
Texas a and M Univ, Center, Lubbock.
For primary bibliographic entry see Field 03F.
W71-12739

THE INFLUENCE OF A WINDBREAK ON EVAPORATION,
Israel Meteorological Service, Bet-Dagan. Agrometeorological Div.
For primary bibliographic entry see Field 03B.
W71-12746

MEASUREMENTS OF GLOBAL SOLAR RADIATION IN ISRAEL,
Volcani Inst. of Agricultural Research, Rehovoth (Israel).
G. Stanhill.
Israel Journal of Earth-Sciences, Vol 19, No 2, p 91-96, 1970. 3 tab, 5 ref.

Descriptors: *Solar radiation, *Arid lands, *Seasonal, *Climatic data, Rainfall, Transmissivity, Cloud cover, Instrumentation, Measurement.
Identifiers: *Israel, *Pyranometers, *Insolation.

Details of global radiation measurements from 9 Israeli pyranometer stations covering 28 station-years are presented and analyzed. The mean annual isolation is 181 Kcal/sq.cm./yr, among the most intense in the world. Year-to-year variation in annual and summer half-year totals was less than 2%, with winter deviation being about 3 times greater than summer deviation. Correlations of winter rainfall with global radiation were weakly negative and suggested a reduction in winter insolation in areas with an annual rainfall greater than 400 mm. Since atmospheric transmissivity was similar throughout the year, atmospheric factors could not be responsible for seasonal variation in global radiation. The areal differences found do not correspond to those calculated from cloud cover observations nor to the climatological or topographical regions of the country. Instrumental causes for such differences cannot be excluded. (Casey-Arizona)
W71-12747

A PSYCHROMETRIC APPROACH TO SCHEDULE IRRIGATION,
Puerto Rico Univ., Rio Piedras. Agricultural Experiment Station.
Modesto Capiel.
J Agr Univ P R. 54 (4): 624-630, Illus, 1970 (Span summ).
Identifiers: Atmosphere, Demands, Evaporative, Irrigation, Psychrometric, Schedule.

A laboratory evaluation was directed to provide a means for assessing the need for irrigation based on the simultaneous appraisal of the evaporative demands of the atmosphere and the free energy of water at the soil surface. The method essentially consists in recording the difference in evaporative cooling between a non-ventilated wet bulb thermojunction at the height of a crop canopy and less intensive evaporative cooling at the soil surface, as evaporation proceeds and the free energy of soil water decreases. Utilizing the principle of the thermocouple, a curve is obtained in a microvolt recorder which gets steeper as the evaporative de-

mands increase with time. Statistical data are presented which indicates that the continuously recorded potential (delta t) is a major function of evaporative demands of the air (ed), of the moisture content of the matrix material (theta), and of its evaporation rate (em).--Copyright 1971, Biological Abstracts, Inc.
W71-12940

METHODICAL INVESTIGATIONS USING THE LYSIMETER STATION IN CASTRICUM (NETHERLANDS),
M. Schroeder.
Forst-Wiss Centralbl. 89 (4): 200-210. Illus. 1970. (Engl summ).
Identifiers: Black, Castricum, Lysimeter, Methodical, Netherlands, Oak-D, Pine-G, Station.

The lysimeter station consists of 4 large concrete containers (25 x 25 x 2.50 m.) each filled with dune sand and covered with different vegetation; bare soil, dune vegetation, oak and black pine. The time trends of adjusted values of drainage water (year totals) and of differences of paired values are given and compared. Bare soil shows a constant evaporation level of 200 mm./yr. After 7, 12 and 13 yr, similar constant levels of vaporization were found: for dune vegetation, 475 mm; for oak, 500 mm; and for pine, 675 mm. Deviations were due to the kind of vegetation and weather.--Copyright 1971, Biological Abstracts, Inc.
W71-12951

EFFECTS OF SOIL MOISTURE REGIMES ON LEAF WATER DEFICIT, TRANSPIRATION AND YIELD OF TOMATOES,
Scottish Horticultural Research Inst., Dundee.
P. D. Waister, and J. P. Hudson.
J Hort Sci. 45 (4): 359-370. Illus. 1970.
Identifiers: Blossom, Deficit, Evapo, Evaporimeter, Fruit, Gauge, Irrigation, Leaf, Moisture, Radiation, Regimes, Rot, Size, Soil, Solar, Tomatoes-D, Transpiration, Water, Yield.

Tomato plants in a glasshouse were subjected to 4 different water regimes based on soil moisture deficit, which was 1st estimated from evaporation from a simple evaporimeter and then checked by measurement in evapotranspiration gauges. The sensitivity of this species to small deficits was reflected in total yield, fruit size and incidence of blossom end rot. Although relative turgidity levels showed a relationship with soil moisture deficit, this relationship was modified by the stress regimes imposed. Transpiration rates fell with increasing deficit but, under conditions of frequent irrigation, showed good correlation with losses from evaporimeters, which in turn were closely related to incoming solar radiation.--Copyright 1971, Biological Abstracts, Inc.
W71-12966

EVAPOTRANSPIRATION OF WEST JAPAN BY MEANS OF WATER VAPOR BUDGET ANALYSIS,
Kyushu Univ., Fukuoka (Japan). Faculty of Agriculture.
Yoshiharu Shiotsuki.
J Agr Meteorol. 26 (1): 25-33. Illus. Maps. 1970. (In Jap. with Engl. summ.).
Identifiers: Budget, Computer, Evapo, Fluctuations, Japan, Radiosonde, Seasonal, Transpiration, Vapor, Water, West.

A computation was made of the evaporation of mesoscale areas at Kyushu Island and Setouchi district by water vapor budget analysis using radiosonde observations. Calculation by computer, evaporation values and seasonal fluctuations are discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-13026

2E. Streamflow and Runoff

RUNOFF GROUPING FOR DETECTION OF CHANGE IN RUNOFF,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W71-12250

EXPERIMENTS ON PLANE COUETTE FLOW,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 08B.
W71-12253

SELF-AERATED FLOW CHARACTERISTICS IN WALL REGION,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
For primary bibliographic entry see Field 08B.
W71-12254

NONUNIFORM FLOW IN FLAT RECTANGULAR CHANNELS,
Camp, Dresser and McKee, Boston, Mass.
For primary bibliographic entry see Field 08B.
W71-12258

DE SAINT-VENANT EQUATIONS EXPERIMENTALLY VERIFIED,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Hydrology.
For primary bibliographic entry see Field 08B.
W71-12260

FLOOD FREQUENCY ESTIMATING TECHNIQUES FOR SMALL WATERSHEDS.
Hydrocomp International, Palo Alto, Calif.
G. Fleming, and D. D. Franz.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, Paper 8383, p 1441-1460, September 1971. 3 fig, 2 tab, 35 ref, append.

Descriptors: *Flood forecasting, *Rainfall-runoff relationships, *Frequency analysis, *Simulation analysis, *Design flood, Mathematical models, Small watersheds, Computer programs, Storm runoff.
Identifiers: Flood frequency.

A literature search was undertaken to identify hydrologic methods suitable for defining the flood frequency characteristics of streams of less than 20 sq mile drainage area. Comparative testing on 11 small watersheds used digital computer simulation, regional flood frequency analysis, Potter's statistical procedure, and an arbitrarily standardized version of the rational method. For the streams tested, digital simulation using the Hydrocomp Simulation Program was most successful in reproducing the flood frequency curves determined from the historic streamflow. A program of research and development to adapt digital simulation to the derivation of design flows for highway culverts is proposed. (Knapp-USGS)
W71-12261

FLOW IN CHANNELS,
Queen's Univ., Belfast (Northern Ireland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W71-12275

RUNOFF EVALUATION AND STREAMFLOW SIMULATION BY COMPUTER,
Corps of Engineers, Portland, Oreg.
James A. Anderson.
Army Corps of Engineers, North Pacific Division Report, May 1971. 138 p, 13 fig, 19 tab, 13 chart, 17 ref.

Descriptors: *Mathematical models, *Rainfall-runoff relationships, *Computer programs, *Water balance, *Simulation analysis, Model studies, Water resources development, Runoff forecasting, Streamflow forecasting, Base flow, Routing, Flood routing, Open channel flow.
Identifiers: *Southeast Asia.

A computer program was developed to model basin runoff resulting from rainfall and snowmelt. In the watershed model portion of the program, soil moisture-runoff relationships, in the form of continuously varying soil moisture indexes together with variable evapotranspiration indexes, account for the over-all water balance of drainage basins. These indexes provide continuity of functions by which the varying losses due to soil moisture increases and evapotranspiration can be computed for a wide variety of soil and runoff conditions, and may be applied to either rainfall or snow melt runoff. Index values of soil moisture and evapotranspiration are established for a watershed by reconstitution studies or estimates based on climate, topography, geology, vegetation and location of the watershed. Two illustrative examples of reconstitution studies are presented. One shows runoff and the soil moisture relation on a watershed in the Mekong River Basin, and the other shows runoff resulting from rainfall and snowmelt on a small basin in the Cascade Range of western Oregon. (Knapp-USGS)
W71-12289

PRELIMINARY FLOOD--FREQUENCY RELATIONS AND SUMMARY OF MAXIMUM DISCHARGES IN NEW MEXICO--A PROGRESS REPORT,
Geological Survey, Albuquerque, N. Mex.
Arthur G. Scott.
Geological Survey Open-file Report, June 1971. 76 p, 23 fig, 9 tab, 11 ref.

Descriptors: *Floods, *New Mexico, *Frequency analysis, *Stage-discharge relations, *Peak discharge, Regression analysis, Flood forecasting, Data collection, Hydrologic data.
Identifiers: *Flood frequency.

The magnitude and frequency of floods is defined regionally for streams in New Mexico using multipe-regression techniques, relating flood peaks of 2, 5, 10, 25, and 50-year recurrence intervals to selected physical and climatic basin characteristics. The state was divided into three flood regions, and equations and associated standard error of prediction were determined for each of these regions. Maximum observed discharges at regular and crest-stage gaging stations, and all peak dishcarges found by indirect measurements at miscellaneous sites are presented in tabular and graphical form. The equations developed in the study can be used to compute the peak discharges of floods of given recurrence intervals for use in the design of drainage structures. (Knapp-USGS)
W71-12290

SEASONAL SEA-LEVEL VARIATIONS OF THE SOUTH CHINA SEA AND THEIR CAUSES,
Meteorological Service of the City of Hanoi (North Vietnam).
Nguen Ngok Tvi.
Oceanology, Vol 9, No 4, p 465-471, 1970. 7 p, 5 fig, 2 tab, 13 ref.

Descriptors: *Water level fluctuations, *Sea level, *Monsoons, Oceanography, Winds, Waves (Water), Seiches, Synoptic analysis, Fourier analysis, Statistical methods, Tides, Tidal effects, Wind tides.
Identifiers: *South China Sea.

The annual and semiannual periodicity of sea-level oscillations of the South China Sea was studied systematically using spectral and harmonic-analysis methods. The isoamplitudes and isophases of annual waves of mean sea level were mapped. No direct influence of atmospheric pressure on seasonal mean sea-level variations could be found.

Monsoonal circulations seem to be the major cause of these variations in this basin. They generate progressive long waves which are the cause of wind-driven currents and sea-level oscillations. (Knapp-USGS)
W71-12292

NUMERICAL ROUTING OF FLOOD HYDROGRAPHS THROUGH OPEN CHANNEL JUNCTIONS,
Minnesota Univ., Minneapolis. Water Resources Research Center.
Curtis L. Larson, Tsong C. Wei, and C. Edward Bowers.
Available from the National Technical Information Service as PB-202 626, $3.00 in paper copy, $0.95 in microfiche. Minneapolis Water Resources Research Center, St. Paul, Bulletin 40, August 1971. 67 p, 11 fig, 6 tab, 14 ref. OWRR Project B-007-MINN (6).

Descriptors: *Flood hydrographs, *Routing, *Channels, Watershed, Surface runoff, Storm runoff, Overland flow, Numerical analysis, Rainfall-runoff relationships, Roughness coefficient.
Identifiers: *Input hydrographs, *Output hydrographs, *Hydrograph volumes, Backwater effects, Watershed model, Routing equations.

The study was concerned with numerical routing of flood hydrographs through open channel junctions. As open channel junction with a main channel above and below plus a branch channel were constructed in the laboratory. All channels were rectangular in shape, but varied in size. Facilities and procedures for supplying hydrographs to the two channels above the junction were developed. Provision was made for measuring both inflow and outflow hydrographs and also flow depths at selected points in the three channels. A total of 14 experiments were conducted with various combinations of input hydrographs in terms of magnitude and relative timing. Unsteady flow conditions (depth, velocity and discharge) in the three channels were calculated at 5-ft. length increments and 1-sec. time increments, using the method of explicit finite differences applied to the characteristic equations. A procedure for calculating unsteady flow backwater effects in either or both of the upstream channels was developed and utilized as an integral part of the routing method. The junction routing procedure appears to be fairly general, having been applied in a situation where the channels above and below the junction are at different size, slope and elevation. (Walton-Minnesota)
W71-12320

CHARACTERISTICS OF TRANSVERSE MIXING IN OPEN-CHANNEL FLOWS,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.
For primary bibliographic entry see Field 05B.
W71-12357

WATER RECORDS OF PUERTO RICO, 1964-67, VOLUME 1--NORTH AND NORTH EAST SLOPES,
Geological Survey, San Juan (Puerto Rico).
For primary bibliographic entry see Field 07C.
W71-12365

AIDS IN DESIGNING LABORATORY FLUMES,
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 08B.
W71-12366

SIMULATION OF CONTINUOUS REALIZATIONS OF THE STREAMFLOW PROCESS FOR COMPUTING REGULATION,
For primary bibliographic entry see Field 02A.
W71-12397

FORECASTING THE SPRING HIGH-WATER HYDROGRAPH OF FLOOD-PLAIN RIVERS, TAKING THE DESNA RIVER AS AN EXAMPLE,
Gidrometeorologicheskii Institut, Odessa (USSR).
For primary bibliographic entry see Field 04A.
W71-12398

A FLUOROMETRIC TECHNIQUE FOR SAMPLING IN LARGE-RIVER ECOSYSTEMS,
Michigan State Univ., Lansing. Dept. of Fisheries and Wildlife; and St. Marys Coll., Winona, Minn. Dept. of Biology.
C. D. McNabb, E. F. Miller, and D. R. Johann.
Available from the National Technical Information Service as PB-202 700, $3.00 in paper copy, $0.95 in microfiche. Minnesota Water Resources Research Center, St. Paul, Bulletin 34, June 1971. 13 p, 5 fig, 16 ref. OWRR Project B-010-MINN (3).

Descriptors: *Tracers, *Mississippi River, *Ecosystems, *Dye releases, *Fluorometry, Steamflow, Flow rates, Data collections, Ecological distribution, On-site investigations, Tracking techniques, Fluorescence, Limnology, Biota, Fish.
Identifiers: *Dye releases (Rhodamine WT), *Time-of-travel.

A section of the Mississippi River between miles 719 and 722 upstream from St. Louis was used to study large river ecosystems. The flow of the river during the time of the study was between 40,000 and 70,000 cfs. The dimensions of the area and the paths of travel along which the movement of dye was studied are shown. Water along these paths does not intermix. One path is a continuation from upstream of the main navigation channel of the river. Tracer studies indicate that the water moving along this path through the study section has little interaction with the immediate shore zone. The limnological character of this water has been largely fixed by upstream mixing prior to entry on the path. Another path drains an inshore area that has a rather regular beach boundary upstream. Along this course, there is an input of water from shallow areas. These shallow backwaters are of particular limnological interest since the production upon which the food-web of the ecosystem is built appears to occur here. The areas of main current are likely avenues for the dispersal of this production. (Woodard-USGS)
W71-12421

ANALYTICAL RELATIONS IN THE TIME FREQUENCY OF THE TOTAL RIVER RUNOFF AND ITS GENETIC COMPONENTS,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
F. Slepicka.
In: Wellington Symposium - The Results of Research on Representative and Experimental Basins; December 1-8, 1970, New Zealand: New Zealand Journal of Hydrology, Vol 9, No 2, p 78-88, 1970. 11 p, 4 fig, 5 ref.

Descriptors: *Time series analysis, *Rainfall-runoff relationships, *Water balance, *Surface-groundwater relationships, Runoff forecasting, Streamflow forecasting, Routing, Duration curves, Depth-area-duration analysis, Base flow.
Identifiers: *Experimental watersheds.

The law of relation between runoff values and daily groundwater excesses, which contribute to the total runoff, is derived as a power function expressed in the bilogarithmic functional net as a straight line with three sections. Each of these sections is valid for a specific, temporally limited, flow in a specific watercourse. It is possible to carry out the solution for one hydrological year or longer periods. The method facilitates division of groundwater excesses of various origin, determination of their values, and planning for regulation. (Knapp-USGS)
W71-12424

THE HYDROLOGICAL BUDGET AND COMPUTATION OF GROUND-WATER COMPONENTS OF RIVER DISCHARGE IN THE NORTH-WEST PART OF POLICE REPRESENTATIVE BASIN IN CZECHOSLOVAKIA,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
For primary bibliographic entry see Field 02A.
W71-12426

UNIT HYDROGRAPH BY DIFFUSION ANALOGY,
Ministry of Works, Wellington (New Zealand). Civil Div.
F. H. Pearson.
In: Wellington Symposium - The Results of Research on Representative and Experimental Basins; December 1-8, 1970, New Zealand: New Zealand Journal of Hydrology, Vol 9, No 2, p 299-306, 1970. 8 p, 2 fig, 3 tab, 3 ref.

Descriptors: *Unit hydrographs, *Small watersheds, *Routing, *Hydrograph analysis, *Recession curves, Base flow, Diffusion, Rainfall-runoff relationships, Surface-groundwater relationships, Synthetic hydrology.
Identifiers: *Hydrograph synthesis, *Experimental watersheds.

For a New Zealand stream the hydrograph shape could be modelled according to the diffusion of an exponential decay profile, but this model was only valid down stream of the point at which the falling limb of the hydrograph was approximately exponential throughout its length. Having established a property of the stream channel analogous to diffusivity, it was possible to synthesize a hydrograph for any point on the stream (subject to the above limitation) given the time of concentration at that point. Also, from hydrographs at each end of a reach in a stream, the Muskingham method could be used to synthesize a corresponding hydrograph at any other point within or down stream of the original reach, given the time of concentration at that point. Hydrographs synthesized according to the diffusion-analogy method and the Muskingum method were in good agreement. (Knapp-USGS)
W71-12429

CALCULATION OF THE INSTANTANEOUS UNIT HYDROGRAPH USING LAPLACE TRANSFORMS,
Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
P. Johnson.
In: Wellington Symposium - The Results of Research on Representative and Experimental Basins; December 1-8, 1970, New Zealand: New Zealand Journal of Hydrology, Vol 9, No 2, p 307-322, 1970. 16 p, 3 fig, 3 tab, 14 ref.

Descriptors: *Unit hydrographs, *Hydrograph analysis, *Mathematical studies, Rainfall-runoff relationships, Surface-groundwater relationships.

Most recently derived methods for the calculation of the instantaneous unit hydrograph using observed rainfall-runoff data from a catchment have in common the use of integral transform equations and linkage equations. A Laplace transform technique is shown to have direct analogy with the method of moments. Potential accuracy of the Laplace method is illustrated by analyzing synthetic data. Analyses of real data indicate the difficulty in applying such a method in practice until better understanding of data inaccuracy and of the hydrograph models in use is obtained. (Knapp-USGS)
W71-12430

OVERLAND FLOW ON RANGELAND WATERSHEDS,
Agricultural Research Service, Fort Collings, Colo. and Agricultural Research Service, Rapid City, S. Dak.
D. A. Woolhiser, C. L. Hanson, and A. R. Kuhlman.

In: Wellington Symposium - The Results of Research on Representative and Experimental Basins; December 1-8, 1970, New Zealand: New Zealand Journal of Hydrology, Vol 9, No 2, p 336-356, 1970. 21 p, 9 fig, 4 tab, 15 ref.

Descriptors: *Mathematical models, *Overland flow, *Grasslands, *Ranges, Optimization, Roughness (Hydraulic), Darcy-Weisbach equation, Transition flow, Reynolds number, Hydrograph analysis, South Dakota.
Identifiers: *Kinematic cascade model, *Experimental watersheds.

The kinematic cascade was used as a mathematical model to describe overland and open-channel flow for small (0.81-kectare) rangeland watersheds. The friction relationship for overland flow was assumed to be of the Darcy-Weisbach form, with initially laminar flow becoming turbulent at a transitional Reynolds number of 300. Optimum values of the hydraulic roughness parameter were obtained by a univariate optimization procedure for four heavily grazed watersheds and four lightly grazed watersheds for a single storm. Although these watersheds showed substantial differences in vegetal composition and cover, the roughness parameters were not significantly different. The average of the eight optimized parameters was used in kinematic-cascade model to predict hydrographs for four moderately grazed watersheds with very good results. The kinematic-cascade model appears to be satisfactory for describing overland flow on small rangeland watersheds. The roughness parameter is approximately 7,000 for native short-grass prairie rangelands in western South Dakota, U.S.A. (Knapp-USGS)
W71-12432

AN EMPIRICAL RELATIONSHIP BETWEEN RAINFALL AND RUNOFF,
Ministry of Works, Hamilton (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 02A.
W71-12433

METHOD OF CALCULATING SECONDARY FLOW,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
C. -L. Chiu, and T. -S. Lee.
Water Resources Research, Vol 7, No 4, p 834-844, August 1971. 10 fig, 9 ref.

Descriptors: *Open channel flow, *Vortices, *Turbulent flow, *Eddies, Streamflow, Water circulation, Mathematical studies, Hydraulics, Flow resistance.
Identifiers: *Secondary flow.

Secondary flow plays an important role in a number of areas in hydraulics, such as sediment transport, distribution of primary flow velocity and boundary shear, flow resistance, and stream meandering. Secondary currents generated in a straight, triangular open channel were investigated and used to develop a method of calculating secondary flow in an entire transverse cross section of a straight channel. The method developed involves the use in different regions of a cross section of different sets of curvilinear coordinate systems consisting of isovels of primary flow and their orthogonal trajectories. Descriptions of the method as well as calculated results are presented. (Knapp-USGS)
W71-12449

A NOTE ON THE USE OF MARKOV CHAINS IN HYDROLOGY,
Lancaster Univ. Bailrigg (England). Dept. of Mathematics.
For primary bibliographic entry see Field 04A.
W71-12461

ESTIMATION OF DESIGN HYDROGRAPHS FOR SMALL RURAL CATCHMENTS,
New South Wales Univ. Kensington (Australia). School of Civil Engineering.
I. Cordery.
Journal of Hydrology, Vol 13, No 3, p 263-277, July 1971. 6 fig, 3 tab, 15 ref.

Descriptors: *Small watersheds, *Design flow, *Rainfall-runoff relationships, *Hydrograph analysis, *Design flood, Rainfall disposition, Peak discharge, Runoff forecasting, Streamflow forecasting.
Identifiers: *Design hydrographs.

Design hydrograph procedures currently in use usually contain the assumption that the return period of the design hydrograph is equal to the return period of the design rainfall. However, in most cases no provisions are made to attempt to ensure this equality of return periods. A design hydrograph procedure was developed which models separately the major factors influencing the return period of the design hydrograph, such as the rainfall amount, its temporal pattern and the losses from the rainfall. Comparison of design hydrograph peak discharges of given return periods with the corresponding peak floods estimated from frequency analyses of observed floods on 21 catchments in Australia indicate that this type of approach to the estimation of design floods has considerable merit. (Knapp-USGS)
W71-12463

RIVER EROSION DUE TO CHANNEL RELOCATION,
Federal Highway Administration, Concord, N.H.
For primary bibliographic entry see Field 08B.
W71-12469

SEA BOTTOM VELOCITY PROFILES ON THE CONTINENTAL SHELF SOUTH-WEST OF ENGLAND,
Bristol Univ. (England). Dept. of Geology.
R. D. Channon, and D. Hamilton.
Nature, Vol 231, No 5302, p 383-385, June 11, 1971. 3 p, 1 fig, 1 tab, 13 ref.

Descriptors: *Currents (Water), Tides, *Tidal effects, *Sediment transport, Bottom sediments, Bed load, Transition flow, Sea water, Continental shelf.
Identifiers: *England, Karman-Prandtl law.

The peak velocity of tidal currents on the Continental Shelf around the British Isles varies greatly from place to place, nowhere more markedly than in the southwest. In this area the grade of the superficial sediment and the geometry of the sea floor are both highly variable and grain size tends to decrease as tidal current strength weakens along sediment transport paths. Boundary-layer observations were made at ten locations southwest of England. Locations and times of recording were chosen so that most depths and current speeds occurring in the area were represented, at various states of the tide. The Karman-Prandtl laws describe flow well except during very low velocity periods of tidal reversal. This implies an appreciable phase lag of bottom current fluctuations behind those occurring nearer the sea surface. The turbulent boundary layer flow on the shelf southwest of England is usually hydrodynamically transitional to rough. Rough flow predominates during the periods of high Reynolds number that are thought to control the sediment distribution. (Knapp-USGS)
W71-12473

GRAPHIC ANALYSIS OF ROADWAY RUNOFF,
California Div. of Highways, Fresno. District 6.
For primary bibliographic entry see Field 04C.
W71-12587

SPECTRAL METHODS OF STUDYING HYDROLOGIC SERIES (O spektral'nykh metodakh issledovaniya gidrologicheskikh ryadov),
Akademiya Nauk SSSR, Moscow. Inst. of Water Research.
A. I. Davydova.
Meteorologiya i Gidrologiya, No 3, p 72-79, March 1971. 1 fig, 1 tab, 8 ref.

Descriptors: *Hydrologic cycle, *Runoff, *Fluctuation, *Variability, *Mathematical studies, River basins, Streamflow forecasting, Runoff forecasting, Dispersion, Air circulation, Surface runoff, Discharge (Water), Correlation analysis, Probability, Statistical methods.
Identifiers: *USSR, Autocorrelation, Coefficient of variation.

The character of long-term fluctuations in streamflow was examined from the standpoint of studying the internal structure of hydrologic series. Since streamflow is generally a random process with complex cyclic components, it is important to understand the role of cycles in streamflow forecasting and in the long-term regulation of runoff. A spectral method of describing phenomena was used to analyze the temporal and spatial variability of the relationship of atmospheric circulation to the surface runoff of European rivers. Long-term fluctuations in streamflow were presented in the form of a complex harmonic, which considered the effect of 2-, 5-, 7-, and 11-year cycles (runoff series) for 55 basins of the Northern Hemisphere. The contribution of the energy represented by these 4 cycles to the total dispersion of the runoff process was evaluated. Average annual discharges of water from the runoff series fluctuated between 60 and 24,000 cu m/sec, and the coefficients of variation ranged from 0.08 to 0.66. The level of energy corresponding to the long-term variability was highest for the 11-year cycle, decreased for the 7-year cycle and was lowest for the 2-year cycle. A spectral analysis of the structure of long-term hydrologic series confirms the existence of cycles and gives an approximate picture of the character of runoff fluctuations. (Josefson-USGS)
W71-12611

HYDROLOGIC RECONNAISSANCE OF THE PARK VALLEY AREA, BOX ELDER COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
J. W. Hood.
Utah Department of Natural Technical Publication No 30, 1971. 51 p, 4 fig, 2 plate, 14 tab, 15 ref, append.

Descriptors: *Water resources development, *Water supply, *Water quality, *Water yield, *Utah, Surface waters, Groundwater, Hydrologic data, Data collections, Runoff, Aquifers, Water wells, Precipitation (Atmospheric), Water level fluctuations, Chemical analysis, Surveys, Hydrology.
Identifiers: *Hydrologic reconnaissance (Box Elder County-Utah), *Park Valley (Utah).

Water resources data for the Park Valley area (1,050 sq mi) in Box Elder County, Utah are presented. Precipitation is estimated to average 520,000 acre-feet annually. Most runoff and groundwater recharge is derived from precipitation on lands above an altitude of 6,000 feet. An estimated 6,000 acre-feet of groundwater is consumed by beneficial evapotranspiration in crop and pasture lands. The range of concentration of dissolved solids is from 111 to more than 26,000 mg per liter. The freshest water is from streams and springs in the Raft River and Grouse Creek Mountains and the alluvial slopes adjacent to them. The quality of groundwater in the central area ranges from fresh to moderately saline, and very saline water occurs along the edge of Great Salt Lake and along the edge of the Great Salt Lake Desert. Past and present development of water in the Park Valley area has depended mainly on stream and spring flow. The total annual supply of surface and groundwater in the Park Valley area is estimated to be 29,000 acre-feet, but the average annual amount that can be readily diverted is about 17,000 acre-feet. (Woodard-USGS)
W71-12615

ON THE OSCILLATORY FLOW IN TURBULENT BOUNDARY LAYERS INDUCED BY WATER WAVES,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.

Hideaki Noda.
Bulletin of the Disaster Prevention Research Institute, Vol 20, Part 3, No 176, p 127-144, March 1971. 18 p, 10 fig, 2 tab, 11 ref.

Descriptors: *Turbulent boundary layers, *Turbulent flow, *Waves (Water), *Sediment transport, Littoral drift, Hydraulic models, Mathematical models, Unsteady flow, Turbulence, Roughness (Hydraulic).
Identifiers: Oscillatory flow.

A method is presented for calculating various characteristics of the turbulent boundary layers developed on both smooth and rough bottoms by waves. The profiles of velocities and the mass transport velocities in the oscillating turbulent boundary layer are derived theoretically on the basis of a physically meaningful assumption of an eddy viscosity, and the numerical results are compared with existing experimental data. Analytical data on the oscillary flow near the bottom were also applied to a theoretical description of some of the problems of sediment movement such as determination of the predominant direction of sediment transport due to waves. (Knapp-USGS)
W71-12627

ON AIR-SEA INTERACTION IN THE KII CHANNEL,
Kyoto Univ. (Japan). Disaster Prevention Research Inst.
Chotaro Nakajima, and Hiroshi Yoshioka.
Bulletin of the Disaster Prevention Research Institute, Vol 20, Part 3, No 176, p 217-226, March 1971. 10 p, 12 fig, 4 ref.

Descriptors: *Synoptic analysis, *Bays, *Climatology, Weather forecasting, Meteorology, Weather patterns, Air masses, Precipitation (Atmospheric), Weather data.
Identifiers: *Japan, Air-sea interactions.

Using Kii Channel and Osaka Bay, Japan, as a model region, the interrelation between small scale oceanic phenomena in a narrow ocean area and meso-scale atmospheric phenomena was studied. A countercurrent of the Kuroshio flows along the Pacific Coast of Western Japan. This region is orographically open to the south, and favorable for southerly winds to flow into inland parts with horizontal convergence. The oceanic conditions of these seas are summarized, and the atmospheric phenomena which produced these oceanic conditions are described. The existence of a discontinuity of surface water temperature affects the stability of the lower layer of the atmosphere and makes a local distribuiton of dense fog and air pollution. This discontinuous zone of surface water temperature produces a suitable condition for the development of secondary small cyclones of low height. In summer, moist air currents in the lower layer flow into the central part of the Kinki District through the Kii Channel and make a narrow band of concentration of heavy rainfall. (Knapp-USGS)
W71-12628

A METHOD FOR COMPUTING CURRENTS AND WATER EXCHANGE IN KERCH STRAIT,
Hydrometeorological Observatory of the Black Sea and Sea of Azov Basin, Sevastopol (USSR).
E. N. Al'tman, and D. M. Tolmazin.
Oceanology (USSR) Vol 10, No 3, p 333-340, December 1970. 8 p, 3 fig, 2 tab, 14 ref.

Descriptors: *Currents (Water), *Winds, *Salinity, Water balance, Channel morphology, Stratified flow, Seiches, Water levels.
Identifiers: *Black Sea, *Sea of Azov, *Kerch Strait.

A theoretical method is proposed for computing currents and water exchange between the Black Sea and the Sea of Azov through Kerch Strait with explicit allowance for the wind stress at the surface. An expression is obtained for average current velocity and for the rise in level over the undisturbed surface at any point of the strait, assuming that the fluid is vertically homogeneous and that the linear terms of the equations of motion are small. Dynamic forces taken into account include the longitudinal pressure gradient produced by the difference in level, the tangential wind stress on the surface, and the horizontal momentum. The scheme for computing slopes, current velocities, and discharges is described. A nomogram is proposed for computing currents and water exchange from the difference in levels at the ends of the strait, the average wind over it, and the general sea level background. (Knapp-USGS)
W71-12632

THERMAL STRUCTURE OF EQUATORIAL CURRENTS IN THE WESTERN PACIFIC,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
L. K. Moiseyev.
Oceanology (USSR), Vol 10, No 3, p 314-323, December 1970. 10 p, 5 fig, 2 tab, 20 ref.

Descriptors: *Ocean currents, *Ocean circulation, *Mixing, *Thermal stratification, Winds, Oceanography, Oceans, Pacific Ocean, Turbulence, Currents (Water), Velocity, Hydrography, Bathymetry, Water temperature.
Identifiers: Thermal structure (Oceans).

Thermal soundings reveal isothermal (homogeneous) and inversional steplike mesoforms in the vertical oceanographic patterns at depths substantially exceeding the limiting depth of wind mixing. Inversions that frequently lead to density instability constantly appear against the background of isothermal (homogeneous) mixed layers or 'lenses' during interlayer turbulent exchange. Stratification is disturbed frequently. The observed static in stability is apparently sustained by dynamic factors. The uniformly mixed 'lenses' in the trade-wind current system of the south tropical circulation apparently form only within converging meridional flows. In this case, 'lenses' correspond in the first approximation to the position of the intermediate levels of maximum horizontal current velocity gradients in currents of the transverse circulation. The seasonal, or anomalous, displacement of the frontal boundary to the north with simultaneous weakening of the zonal drift circulation of the southern tradewind current reinforces the transverse circulation of waters converging toward the equator and this, in the final analysis, widens the latitudinal distribution of the region with the 'lens' structure. (Knapp-USGS)
W71-12634

EFFECT OF WATER TEMPERATURE AND SALINITY ON THE FORMATION OF OCEAN CURRENTS AT THE EQUATOR,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 02K.
W71-12635

INCREASE IN WATER DENSITY UPON MIXING OF FOUR OCEAN WATER MASSES,
Moscow State Univ. (USSR). Dept. of Geography.
O. I. Mamayev.
Oceanology (USSR), Vol 10, No 3, p 301-308, December 1970. 8 p, 6 fig, 12 ref.

Descriptors: *Density, *Mixing, *Sea water, *Ocean currents, *Ocean circulation, Water chemistry, Water properties, Salinity, Water temperature, Oceanography.
Identifiers: *Kuroshio, *Oyashio.

Using the region where the Kuroshio and the Oyashio interact (northwestern Pacific) as an example, a nomogram was constructed for determining the magnitude of density increase with water mixing. The pattern of the density increase upon mixing in the Kuroshio-Oyashio area is compared with the thermohaline conditions in this area. The maximum increase in density occurs in the isopycnic layer. This layer slopes from the northeast to the southwest from a depth of 50-75 m to 400 m. The maximum increase in density takes place upon mixing of one part of subarctic water with two parts of Kuroshio water. When the mixing of three water masses is analyzed, the increase in density is given by the difference between the true density of sea water and average density determined from the formula of weight-mean value and corresponding to some linear equation of state. When two, four, or more water masses mix, the equation of state for average density can also be nonlinear. (Knapp-USGS)
W71-12636

COMPUTATION OF THE THREE-DIMENSIONAL FIELD OF TIDAL CURRENTS IN THE NORTH SEA,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
V. K. Kraav.
Oceanology (USSR), Vol 10, No 2, p 195-201, November 1970. 7 p, 5 fig, 17 ref.

Descriptors: *Tides, *Tidal effects, *Ocean currents, *Ocean circulation, Currents (Water), Mathematical models, Topography, Water level fluctuations, Turbulence.
Identifiers: North Sea.

The three-dimensional field of average spring tide currents in theNorth Sea is computed. The results of the computations are used to construct maps of the ellipses of tidal currents at the sea surface and at a depth of 30 m. A comparison between the computed and observed maximum currents shows good agreement. (Knapp-USGS)
W71-12647

VARIABILITY OF WIND-DRIVEN AND THERMOHALINE CURRENTS IN THE NORTH ATLANTIC IN RELATION TO VARIATIONS IN MACROSYNOPTIC PROCESSES,
Gidrometeorologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02A.
W71-12653

ANNUAL CYCLE OF VARIATIONS IN THE CIRCULATION AND THERMOHALINE FIELD OF THE NORTH ATLANTIC,
Gidrometeorologicheskii Institut, Leningrad (USSR).
L. A. Zhukov.
Oceanology (USSR), Vol 10, No 5, p 608-610, 1970. 3 p, 1 fig, 4 ref.

Descriptors: *Ocean circulation, *Ocean currents, *Salinity, *Atlantic Ocean, Sea water, Water circulation, Water temperature, Density stratification, Thermal stratification, Meteorology, Synoptic analysis.
Identifiers: *Gulf Stream.

The seasonal variations in the circulation and the thermohaline structure of the upper 200-m layer of the Atlantic Ocean were computed by use of a model of the over-all circulation and of the average vertical temperature and salinity fields. Some of the characteristics of the normal annual cycle of variation of horizontal circulation and of the thermohaline structure are discussed on the basis of the results of the model computations. The volume of water transported in winter is almost three times that transported in summer. The period required for one complete circuit of water is 4 to 5 years. The heating of the ocean during the warm part of the year propagates from equatorial and temperate latitudes toward the central part. The seasonal salinity maxima form in winter in the Gulf Stream. (Knapp-USGS)
W71-12654

ON THE MESOSTRUCTURE OF GEOSTROPHIC CURRENTS IN MID-OCEAN,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.

M. N. Koshlyakov, L. I. Galerkin, and Chu'ong Dinh Hie'n.
Oceanology (USSR), Vol 10, No 5, p 637-646, 1970. 10 p, 6 fig, 1 tab, 4 ref.

Descriptors: *Ocean currents, *Ocean circulation, *Oceanography, Velocity, Synoptic analysis, Winds, Water temperature, Tides, Tidal effects.
Identifiers: Geostrophic currents.

Two hydrological surveys by the R/V Faddey Bellingsgauzen in the South Arabian Sea from January through April 1967 yielded data on the structure of geostrophic currents in the 0- to 1500-m layer, averaged over about 10 days and 100 km. Intense development of large-scale geostrophic turbulence was confirmed. During the second period of the observations, marked rotation of the flow velocity vector with depth was observed at certain points; this is attributed to the instability of the wind field above the ocean. (Knapp-USGS)
W71-12655

THE USE OF ELECTRICAL ANALOG MODELS FOR STUDYING DYNAMIC PROCESSES IN THE SEA,
Gidrometeorologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 07C.
W71-12657

RIVER DISCHARGE INTO THE BALTIC SEA IN 1951-1960,
State Inst. of Hydrology and Meteorology, Warsaw (Poland).
Zd. Mikulski.
Oceanology (USSR), Vol 10, No 6, p 785-789, 1970. 5 p, 2 fig, 3 tab, 19 ref.

Descriptors: *Streamflow, *Discharge (Water), Water balance, Rivers, Runoff, Data collections.
Identifiers: *Baltic Sea, *Poland.

River discharge into different parts of the Baltic Sea is discussed on the basis of new data. Discharge in various areas is compared with the volume of sea water. The entire Baltic Sea received 440 cu km (14,000 cu m/sec) of river water in 1951-1960. This makes up a 115-cm thick water layer in the sea. The annual inflow of river water into the Baltic Sea accounts for 2% of its volume. Recent flow calculations in Poland showed that in 1951-1960 streamflow was several percent below the long-period value. Compared with the period between the wars, this decrease amounts to 5% for the Vistula River and 10% for the Oder River. The greatest inflow of river water into the Baltic Sea occurs in the spring (April-June) with a maximum in May (14% of annual inflow). The minimum inflow, which is 50% of the maximum, occurs in the autumn-winter period (November-January), in the storm season. (Knapp-USGS)
W71-12658

ON THE PARAMETRIC DESCRIPTION OF TEMPERATURE PROFILES IN THE ACTIVE OCEAN LAYER,
Yu. Z. Miropol'skiy, B. N. Filyushkin, and P. P. Chernyshkov.
Oceanology (USSR), Vol 10, No 6, p 892-895, 1970. 1 fig.

Descriptors: *Water temperature, *Sea water, *Oceans, *Thermal stratification, Thermocline, Bathythermographs.
Identifiers: Ocean temperature profiles.

A method for the parametric description of vertical temperature profiles in the active ocean layer is proposed. Universal functions, describing the dependence of the dimensionless temperature profile (gradient) on the dimensionless vertical coordinate, are constructed on the basis of measurements by ocean weather ships at two points in the North Pacific. Approximation formulas for these relationships are proposed, which make it possible to reconstruct from standard parameters the average monthly values of the annual water temperature variation at any depth within the active ocean layer. (Knapp-USGS)
W71-12661

CHEMICAL GAUGING OF STREAMFLOW,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
F. C. Bell.
New South Wales University, Water Research Laboratory Report No 117, December 1969. 49 p, 6 fig, 3 tab, 22 ref.

Descriptors: *Streamflow, *Flow measurement, *Chemicals, *Colorimetry, *Tracking techniques, Sodium compounds, Analytical techniques, Evaluation, Laboratory tests, On-site tests, Stream gages, Current meters.
Identifiers: *Streamflow (Chemical gaging), *Tracking techniques (Sodium dichromate).

Chemical dilution methods of stream gaging with sodium dichromate were tested in a tilted laboratory flume for flows up to 5 c.f.s. and at various locations on a range of natural streams for flows up to 210 c.f.s. Accurate check calculations of flow were available with the flume tests and showed probable errors of 4.5% for the constant injection method. In turbulent sections of natural streams this method was found to have about the same accuracy as current meter gagings under ordinary flow conditions. Similar orders of accuracy were obtained with the sudden injection method. The constant injection chemical gaging technique with sodium dichromate is a useful ancillary method with special advantages over current meters in certain circumstances. (Knapp-USGS)
W71-12664

THE UNIT HYDROGRAPH - A TECHNIQUE FOR ROUTING RESERVOIR RELEASES,
Geological Survey, Washington, D.C.
V. B. Sauer.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B259-B264, 1971. 5 fig, 1 tab, 2 ref.

Descriptors: *Routing, *Unit hydrographs, *Water management (Applied), *Waste dilution, Hydroelectric plants, Stage-discharge relations, Discharge (Water), Water storage, Reservoir operations.
Identifiers: Toledo Bend Reservoir (Texas).

The unit-hydrograph technique was successfully used to route power-demand reservoir releases from Toledo Bend Reservoir, Texas to 3 locations as far as 50 miles downstream on the Sabine River. The method is empirical and requires that the storage-discharge relation of the channel be basically linear, and that flood-wave traveltime be relatively constant through the range of discharge being routed. (Knapp-USGS)
W71-12682

WATER RESOURCES DATA FOR COLORADO: PART I. SURFACE WATER RECORDS, 1970.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W71-12685

THE W.A.T.E.R. SYSTEM: COMPUTER PROGRAMS FOR STREAM NETWORK ANALYSIS,
Purdue University, Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 07A.
W71-12689

AN ENGINEERING STUDY OF AIR AND WATER INTERFACIAL INTERACTION,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 08B.
W71-12700

FLOODS IN ARKANSAS, MAGNITUDE AND FREQUENCY CHARACTERISTICS THROUGH 1968,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 07C.
W71-12789

WINTER REGIME OF RIVERS AND LAKES,
Cold Regions Research and Engineering Lab. Hanover, N.H.
For primary bibliographic entry see Field 02C.
W71-12792

CONTRIBUTION OF ATMOSPHERIC CHLORIDE IN WATER FROM SELECTED COASTAL STREAMS OF CENTRAL CALIFORNIA,
Miami Univ., Oxford, Ohio. Dept. of Geology.
For primary bibliographic entry see Field 02K.
W71-12813

OVERLAND FLOW ON AN INFILTRATING SURFACE,
Agricultural Research Service, Tucson, Ariz., Southwest Watershed Research Center.
For primary bibliographic entry see Field 02G.
W71-12829

IRAQ'S WATER RESOURCES,
Institute for Applied Research on Natural Resources, Abu-Ghraib (Iraq).
K. Ubell.
Nature and Resources, Vol 7, No 2, p 3-9, June 1971. 4 fig, 3 tab.

Descriptors: *Water resources development, *Surface waters, *Streamflow, *Water supply, *Water yield, Water utilization, Consumptive use, Runoff, Water storage, Hydrologic data.
Identifiers: *Iraq, Tigris River, Euphrates River.

The potential surface-water resources in Iraq are estimated at 2,679 cubic meters per second (84,485 million cubic meters per year). The annual volume of flow in the upper stations of the Tigris and Euphrates as well as in the tributaries represent the potential surface-water resources. The distribution of surface-water resources is tabulated. Monthly distribution of maximum, minimum and multi-annual average discharges are illustrated. In a critical dry year the water resources are much less, about 25,000 million cubic meters per year, which represents only half the present water consumption. (Woodard-USGS)
W71-12833

OPTICAL CURRENT METER USE IN SOUTHERN CALIFORNIA,
Geological Survey, Garden Grove, Calif.
For primary bibliographic entry see Field 07B.
W71-12838

THE ECOLOGY OF RUNNING WATERS,
Waterloo Univ. (Ontario). Dept. of Biology.
H. B. N. Hynes.
Toronto, Canada, University of Toronto Press, 1970. 555 p.

Descriptors: *Ecology, *Running waters, *Aquatic habitats, *Reviews, Ecological distribution, Limiting factors, Migration, Streams, Hydrologic cycle, Fish, Insects, Aquatic organisms, Habitats, Food chains, Productivity, Primary productivity, Bibliographies, Distribution patterns, Water pollution effects.
Identifiers: Textbooks.

This book was written to provide a comprehensive and critical review of the literature on the biology of rivers and streams. The bibliography contains over 1,500 entries of papers cited in the text. The

topics discussed include water flow and stream channels, physical characteristics of flowing water, chemical characteristics of flowing water, attached algae, higher plants, plankton, composition of the benthic invertebrate fauna, anatomical and behavioral adaptations of benthic invertebrates, feeding mechanism and food of benthic invertebrates, factors controlling benthic invertebrates, effects of downstream movements of organisms on the benthos, life histories and seasonal cycles of benthic invertebrates, the fishes of running water, ecological factors affecting fishes, other invertebrates, longitudinal zonation, special habitats, the ecosystem, and effects of man on watercourses. (Knapp-USGS)
W71-12842

HYDROMORPHOLOGICAL INVESTIGATIONS OF FLOOD PLAIN AND CHANNEL PROCESSES (Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protsessov).
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12843

USE OF AERIAL PHOTOGRAPHY FOR EVALUATING THE FLOODING AND DISCHARGE OF RIVER FLOOD PLAINS AND THE DEVELOPMENT OF FLOODPLAIN FLOWS (Primeneniye aerofotos'yemki k otsenke protsessov zatopleniya i oporozhneniya rechnykh poym i razvitiya poymennykh techeniy),
State Hydrological Inst., Leningrad (USSR).
I. V. Popov, and Yu. S. Gavrin.
In: Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protsessov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 183, p 4-25, 1970. 11 fig, 2 tab, 2 ref.

Descriptors: *Flood plains, *Overland flow, *Overflow, *Channel morphology, *Aerial photography, Hydrometry, Floods, Discharge (Water), Flow rates, Water level fluctuations, River flow, Slopes, Unsteady flow, Low water mark.
Identifiers: *USSR, *Channel pattern, Oka River, Aerohydrometry.

The possibility of using aerial photography for determining the flooding and discharge on flood plains and for establishing the hydrodynamic characteristics of flood-plain flows was based on a study of a freely meandering reach of the Oka River near Doschatoye, 22 km above the city of Murom (Vladimir Oblast). The role of overflow channels, defined as locations of concentrated flow onto flood plains, was examined. Three basic types of overflow channels were distinguished: (1) the upper type, which is a channel flowing over depressions in levees and usually found in the upper part of the flood plain; (2) the lower type, which is basically the most depressed section in the lower part of the flood plain where water accumulates; and (3) the inland type, which is formed on levees dividing the individual sections of the flood plain. The discharges of water in the overflow channels were determined from aerohydrometric observation data. Aerial photographs, which revealed 11 different water boundaries on the flood plain during the high-water periods of April 1968 and 1969, were used to identify the boundaries of six different flooded areas. A combination of aerial photographs, aerohydrometric data and the hydrometric data available on water discharges, slopes, and water-level fluctuations makes it possible to determine the flooding and discharge processes and the volume of flow on river flood plains. (See also W71-12843) (Josefson-USGS)
W71-12844

ON-SITE INVESTIGATIONS OF THE HYDRAULICS OF A FLOOD PLAIN DURING A PERIOD OF VERY HIGH WATER (Naturnyye issledovaniya gidravliki poymennogo massiva v vysokoye polovod'ye),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12845

AN EXPERIMENTAL STUDY OF THE HYDRAULICS OF FLOOD-PLAIN CHANNELS IN LIMITED MEANDERING (Eksperimental'noye issledovaniye gidravliki poymennykh rusel pri ogranichennom meandrirovanii),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12846

RELATIONSHIP OF THE TYPES OF CHANNEL PROCESS TO THEIR DETERMINANT FACTORS (Svyaz' tipov ruslovogo protsessa s opredelyayushchimi faktorami),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12847

CHANNEL DYNAMICS OF MOUNTAIN RIVERS (Problemy ruslovoy dinamiki gornykh rek),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12848

RELATIONSHIP OF THE HORIZONTAL DEFORMATION RATE OF A RIVER CHANNEL TO THE RIVER DISCHARGE AND MORPHOLOGICAL REFORMING CYCLES (K voprosu o svyazi skorosti planovykh deformatsiy rechnogo rusla s vodnost'yu reki i tsiklami morfologicheskikh pereformirovaniy),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12849

ON-SITE INVESTIGATIONS OF THE MORPHOLOGY AND HYDRAULICS OF MEANDERS IN FREE MEANDERING (Naturnyye issledovaniya morfologii i gidravliki izluchin svobodnogo meandrirovaniya),
State Hydrological Inst., Leningrad (USSR).
V. A. Vinogradov.
In: Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protessov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 183, p 119-142, 1970. 7 fig, 4 tab, 9 ref.

Descriptors: *Channel morphology, *Channel flow, *Meanders, *Sediments, *Hydraulics, Stream erosion, Channel erosion, Slopes, Deposition (Sediments), Discharge (Water), Velocity, Flow rates, Dunes, Banks, High water mark, Low water mark, On-site investigations.
Identifiers: USSR, Polomet' River, Channel deformations, Sinuosity, Bends, Flow velocities.

Detailed field studies of the deformations of a channel and of its individual morphological formations are necessary for developing methods for calculating and forecasting channel deformations. To study the development of a channel process, investigations were conducted in 1969 on the Polomet' River in a reach of free meandering and in 16 neighboring meanders. The reach under consideration is located in a zone of sediment redeposition near the village of Zelenyy Bor. The sinuosity coefficient of the channel in this reach is 1.98. The height of the banks during the low water period is 3-3.5 m. The slopes of the free water surface at low water are 0.2-0.4% and the minimum discharge is 1 cu m/sec. During the high water period the maximum discharge amounts to 100 cu m/sec. The flow velocity is 1.3-1.5 m/sec and the average sediment concentration is 500 g/cu m. The river width at high water is 40-50 m in the bends and 80-90 m at the points of maximum curvature. The maximum depth over the riffles is 1.5-2.0 m and over the pools, 3-4 m. The angular velocity of the development of each separate meander depends largely upon the rate of development of the adjacent meanders and at times upon the more distant ones. The angular velocity of the horizontal deformations of the meanders on the Polomet' River also depends to a large extent upon the degree of meander development. To properly understand and determine the horizontal channel deformations and the structure of the velocity field of flow in free meandering, it is necessary to consider the flow and channel characteristics of each separate meander in relation to the same characteristics of adjacent meanders. (See also W71-12843) (Josefson-USGS)
W71-12850

APPLICATION OF COMPUTERS TO THE CALCULATION OF THE MORPHOMETRIC CHARACTERISTICS OF A CHANNEL IN A POINT BAR TYPE OF CHANNEL PROCESS (O vychislenii na EVM morfometricheskikh kharakteristik rusla pri pobochnevom tipe ruslovogo protsessa),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12851

HYDRAULIC MODELING OF FLOWS IN BODIES OF WATER (Gidravlicheskoye modelirovaniye techeniy v vodoyemakh),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12853

2F. Groundwater

DEVELOPMENT OF SYSTEMS FOR GROUND WATER RECHARGE INTO THE OGALLALA FORMATION,
Texas Tech Univ., Lubbock. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04B.
W71-12245

THE EFFECTS OF DRAIN WELLS ON THE GROUND-WATER QUALITY OF THE SNAKE RIVER PLAIN,
Idaho Bureau of Mines and Geology, Moscow.
Donn E. Abegglen, Alfred T. Wallace, and Roy E. Williams.
Idaho Bureau of Mines and Geology Pamphlet 148, October 1970. 51 p, 9 fig, 9 tab, 45 ref, 3 append.

Descriptors: *Water pollution sources, *Injection wells, *Idaho, *Waste water disposal, *Aquifers, *Basalts, Hydrogeology, Aquifer characteristics, Water sources, Water supply, Water quality, Water pollution control, Path of pollutants, Water quality control.
Identifiers: *Snake River Plain (Idaho).

The eastern Snake River Plain aquifer of southern Idaho is composed of a series of successive basalt (lava) flows with interflow beds of pyroclastic and sedimentary materials. The aquifer is the highest yielding water bearing sequence of rocks in Idaho and the principal domestic water supply resource in southeastern Idaho. Wells which extend down into the fractured basalt aquifers of the Snake River Plain of southern Idaho are being used for the disposal of sewage, street drainage, irrigation excess water, and industrial wastes. Based on a field inventory of drain wells in 1969 and 1970, it is estimated that there are approximately 5000 drain wells in the Snake River Plain of southern Idaho. Of these 5000 wells, approximately 3000 drain wells are concentrated in Lincoln, Jerome, and Gooding Counties. A bacterial pollution problem exists on a local scale and corrective measures are needed immediately to protect the public health in several areas of the Plain. Effective alternatives to the use of drain wells exist. Sewage, street drainage, and industrial waste drain wells can be eliminated if municipal sewerage, above-ground and sub-surface soil absorption systems, and sedimentation-recirculation systems are implemented. (Knapp-USGS)
W71-12274

NATURAL HYDROTHERMAL SYSTEMS AND EXPERIMENTAL HOT WATER/ROCK INTERACTIONS (PART II),
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
For primary bibliographic entry see Field 02K.
W71-12284

SOME SEISMIC MEASUREMENTS ON THE VIRGINIA COASTAL PLAIN,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Geological Sciences.
E. S. Robinson, and J. K. Costain.
Virginia Water Resources Research Center, Blacksburg, Completion Report, August 1971. 37 p, 15 fig, 2 tab, 6 ref. OWRR A-034-VA (1).

Descriptors: *Seismic design, Seismic waves, *Stratigraphy, Groundwater basins, Subsurface investigations, Subsurface waters, Virginia, *Coastal plains, Sediments, Seismic studies.
Identifiers: *Virginia Coastal Plain stratigraphy, Seismic survey costs.

Seismic reflection and refraction measurements were made at two sites on the Va. Virginia coastal plain to evaluate the capability of the methods for determining total thickness and stratigraphic subdivision of the unconsolidated sediments. The study was also devised to provide cost estimates for future work. Seismic reflections were recorded from the base of the unconsolidated sedimentary section, and from a least 3 horizons within the section at both sites. RMS velocities obtained by hyperbolic scanning of digital data were used in interval velocity calculations to represent stratigraphic subdivisions. Total thickness of approximately 1000 ft and 500 ft were measured to an accuracy of better than 5%. Sediment velocities ranged from 4000 ft/sec to 7000 ft/sec in contrast to values in excess of 16000 ft/sec for the underlying consolidated rock. Seismic velocity horizons could be correlated approximately with well log indications of some lithologic changes. Seismic refraction arrivals from consolidated rock beneath the coastal plain sediments were easily obtained with 2 to 4 ft of prima cord at depths of 10 ft. Refraction data yield total thickness values accurate to only approximately 10% owing to the presence of low velocity zones indicated by reflection data. Routine field operations would require three men for 3 to 6 hrs. Costs of expendable supplies, computer analysis time, and interpretation are estimated at less than $75 for a reflection and refraction site, and less than $37 for refraction surveys only.
W71-12323

WATER RECORDS OF PUERTO RICO, 1964-67, VOLUME 1--NORTH AND NORTH EAST SLOPES,
Geological Survey, San Juan (Puerto Rico).
For primary bibliographic entry see Field 07C.
W71-12365

DYNAMICS OF THE TRANSITION ZONE BETWEEN FRESH AND SALT WATERS IN COASTAL AQUIFERS,
California Univ., Berkeley. Coll. of Engineering.
Avdhesh Kumar Tyagi.
PhD Thesis, California University Graduate School, 1970. 168 p, 35 fig, 19 tab, 83 ref. OWRR Project B-041-CAL (2).

Descriptors: *Saline water intrusion, *Saline water-freshwater interfaces, *Hydrogeology, *Aquifers, *Mathematical models, Numerical analysis, Withdrawal, Viscosity, Density, Dispersion, Diffusion, Tides, Tidal effects, Aquifer characteristics, Recharge, Discharge (Water).
Identifiers: *Coastal aquifers.

Intrusion, dispersion, and the fresh-salt water interface in coastal aquifers were studied. The subject was treated both as a hydrologic phenomenon and as a phenomenon of dispersion by tidal fluctuation near the coastline. Mathematical models including the density and viscosity effects were developed and graphically represented. These models, when compared with the models neglecting the viscosity effect, showed that the viscosity difference affects the movement of interface greatly in the overdraft regime as compared to recharge flow condition. A sharp interface between the salt and fresh waters does not exist, because they are miscible. Thus, a transition zone is caused by the movement of the interface because of varying hydrologic conditions and tidal oscillations. Since most relationships were plotted on dimensionless graphs, this unified model will simulate and predict the movement of a fresh-salt water transition zone under different field conditions in any aquifer. (Knapp-USGS)
W71-12367

GROUNDWATER RESOURCES OF BURKE AND MOUNTRAIL COUNTIES,
Geological Survey, Bismarck, N. Dak.
C. A. Armstrong.
North Dakota Geological Survey Bulletin 55, Part III, and North Dakota Water Commission, County Groundwater Studies 14, Part III, 1971. 86 p, 22 fig, 4 plate, 1 tab, 36 ref.

Descriptors: *North Dakota, *Water wells, *Water supply, *Groundwater, *Hydrogeology, Hydrologic cycle, Water resources, Aquifer characteristics, Water yield, Confined water, Gravels, Sands, Till, Glacial drift, Pleistocene Epoch, Subsurface waters, Water quality, Groundwater movement, Sodium sulfate, Calcium sulfate, Water utilization.
Identifiers: Burke County (N Dak), Mountrail County (N Dak), Terminal moraines.

This investigation was conducted to determine the quantity and quality of groundwater available in Burke and Mountrail Counties, North Dakota. The chief source of local groundwater is from the glacial deposits of the New Town and Shell Creek aquifer systems in Mountrail County, and the Columbus aquifer in Burke County. The New Town aquifer consists of about 307 feet of sands and gravels with a yield of about 500 gpm. Water quality varies from a hard sodium bicarbonate to a hard sodium sulfate type. The Shell Creek aquifer composed of glacial outwash has a yield of 300 gpm. Water quality changes with depth from a hard sodium sulfate to a hard sodium sulfate bicarbonate type. The Columbus aquifer composed of glaciofluvial deposits is divided into two zones separated by glacial till and silt. The lower zone has water of sodium bicarbonate type while the upper water is a very hard sodium sulfate to calcium sulfate type. The aquifer has a yield of 200 gpm. Local bedrock yields are small and water from these underlying Tertiary (Paleocene) and Cretaceous beds are generally too saline to be used for stock, irrigation, or for human consumption. (Glasby-USGS)
W71-12368

GROUNDWATER BASIC DATA, NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
For primary bibliographic entry see Field 07C.
W71-12370

GROUNDWATER BASIC DATA, BENSON AND PIERCE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 07C.
W71-12371

PEDOTURBATION BY ARTESIAN ACTION,
North Dakota State Univ., Fargo. Dept. of Soils.
For primary bibliographic entry see Field 02G.
W71-12384

THEORETICAL ANALYSIS OF AQUIFER RESPONSE DUE TO DEWATERING AT WELLAND,
Hydrology Consultants Ltd., Cooksville (Ontario).
E. O. Frind.
Canadian Geotechnical Journal, Vol 7, No 2, p 205-216, May 1970. 9 fig, 5 ref.

Descriptors: *Mathematical models, *Drawdown, *Dewatering, *Unsteady flow, *Groundwater movement, Water levels, Pumping, Transmissivity, Water storage, Aquifers, Hydrogeology, Aquifer characteristics, Dolomite, Parametric hydrology, Simulation analysis, Water table.
Identifiers: *Canada, *Welland Canal.

The regional response of an aquifer due to depressurization at the Welland Canal construction site was studied using a mathematical model. The aquifer consists of the upper fractured zone of the bedrock, overlain by a poorly-permeable confining layer which permits recharge and discharge through leakage. The permeability in the aquifer varies throughout the area. The model is two-dimensional in the horizontal plane and represents the nonhomogeneous continuum of the aquifer by a finite number of nodes arranged in a grid. From the differential equation of flow, a system of linear equations was derived and solved by computer. Unsteady flow conditions were approximated by solving the system for discrete steps in time, from commencement of pumping up to equilibrium. Model parameters, consisting of the nodal values of transmissibility, leakage, and storage coefficient, were established by simulation of an actual period of pumping, for which the regional response was determined from readings at observation wells. The model can be applied to solve any number of practical problems relating to aquifer response within the area. (Knapp-USGS)
W71-12386

HYDROGEOLOGIC ASPECTS OF DEWATERING AT WELLAND,
University of Western Ontario, London. Dept. of Geology.
R. N. Farvolden, and J. P. Nunan.
Canadian Geotechnical Journal, Vol 7, No 2, p 194-204, May 1970. 12 fig, 12 ref.

Descriptors: *Drawdown, *Hydrogeology, *Dewatering, *Unsteady flow, *Groundwater movement, Transmissivity, Pumping, Canals, Dolomite, Aquifers, Aquifer characteristics, Storage coefficient, Discharge (Water), Mapping, Water table, Theis equation.
Identifiers: *Canada, *Well interference, *Welland Canal.

Realignment of the Welland Canal between Port Robinson and Port Colborne and the building of underpass structures necessitated both temporary and permanent depressurizing of an artesian aquifer. The aquifer is a thin zone of fractured dolomite found immediately beneath approximately 60 to 100 ft of poorly-permeable glacial till and lacustrine sediments. Problems in connection with the dewatering and depressurizing included design of deep-well pumping systems for excavation work, prediction and monitoring of drawdown effects, and the determination of responsibility for interference in specific areas since several dewatering systems with overlapping cones-of-depression would be operating simultaneously. A contour map of the original piezometric surface was constructed from drillers' records. This map showed a normal groundwater flow system where the movement of groundwater was from local upland recharge areas to local discharge areas along the Welland River and the existing canal. A contour map of the drawdown was drawn on the assumption that deviations from the reconstructed original piezometric surface were caused by dewatering. Analysis of the cone-of-depression along with analyses of pre-engineering pumping tests provided values for aquifer coefficients required for solution of the unsteady flow equations. (Knapp-USGS)
W71-12387

EFFECT OF GROUNDWATER LEVELS ON STRESS HISTORY OF THE ST. CLAIR CLAY TILL DEPOSIT,
University of Western Ontario, London. Dept. of Engineering Science.

For primary bibliographic entry see Field 08D.
W71-12388

PHOTO-INTERPRETATION STUDIES IN THE LOCATION OF PRAIRIE GROUNDWATER SUPPLIES,
Mollard (J.D.) and Associates Ltd., Regina (Saskatchewan).
For primary bibliographic entry see Field 07B.
W71-12391

CLASSIFICATION OF MINERAL WATERS OF THE UKRAINIAN CARPATHIANS (Klassifikatsiya mineral'nykh vod Ukrainskikh Karpat),
Gosudarstyennyi Meditsinskii Institut, Chernovtsy (USSR).
For primary bibliographic entry see Field 02K.
W71-12437

RELATIONS BETWEEN THE ABSTRACTION OF GROUND WATER AND THE VARIATIONS OF GROUND-WATER LEVEL,
Ceskoslovenska Akademie Ved, Brno. Geograficky Ustav.
For primary bibliographic entry see Field 04B.
W71-12462

TERTIARY LIMESTONE AQUIFER SYSTEM IN THE SOUTHEASTERN STATES,
Geological Survey, Raleigh, N.C.
H. E. LeGrand, and V. T. Stringfield.
Economic Geology, Vol 66, No 5, p 701-709, August 1971. 3 fig, 14 ref.

Descriptors: *Karst, *Hydrogeology, *Limestones, Carbonate rocks, Dolomite, Erosion, Weathering, Topography, Aquifers, Surface-groundwater relationships, Groundwater movement, Discharge (Water), Recharge, Joints (Geology), Fissures (Geology).
Identifiers: *Limestone aquifers.

The hydrogeologic history of the Tertiary limestone system of the Southeastern States is reconstructed, especially as it relates to circulation of groundwater and the development of solution cavities. Some general principles of the circulation of water in limestone terranes and the related development of solution openings are reviewed so that a generic basis for comparison can be made of the modern southeast carbonate setting with the Ordovician carbonate setting in Tennessee. The major requirements for solutional development as cavities- (1) presence of highly soluble material, (2) a fracture system or some other form of incipient permeability, (3) water undersaturated with respect to soluble rocks, such as recharge from precipitation, and (4) hydraulic gradient--are found in the Tertiary limestone terrane of the southeast; much of the limestone has been elevated above sea level as a homoclinal seaward-dipping unit. Such a broad homoclinal setting, which also existed in the Knox at the close of early Ordovician time, facilitates extensive solutional development in the upper part of the zone of saturation. Circulation of water great enough to form a significant cavern network requires concentrated discharge areas, commonly as entrenched permanent streams or near-shore springs and seepage. This condition prevails where the Tertiary limestone is fairly close to land surface. (Knapp-USGS)
W71-12595

A GEOCHEMICAL HYPOTHESIS FOR DOLOMITIZATION BY GROUND WATER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W71-12597

CRITICAL SALT REGIME OF IRRIGATED SOILS AND GROUNDWATER DRAINAGE IN THE COTTON GROWING ZONE (Kriticheskiy solevoy rezhim oroshayemykh pochv i drenazh gruntovykh vod v zone vozdelyvaniya khlopka),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 03C.
W71-12606

GROUNDWATER RESOURCES, COMPOSITION AND DYNAMICS IN THE LATVIAN SSR (Resursy, sostav i dinamika podzemnykh vod Sredney Pribaltiki),
All-Union Research Inst. of Marine Geology and Geophysics, Riga (USSR).
I. L. Dzilina.
Izdatel'stvo 'Zinatne', Riga, 1970. 186 p.

Descriptors: *Groundwater, *Groundwater movement, *Groundwater recharge, *Surface-groundwater relationships, *Hydrogeology, Geomorphology, Confined water, Aquifers, Glacial drift, Base flow, Geologic formations, Water level fluctuations, Quaternary period, Structural geology, Geologic time, Water supply, Pressure head, Water chemistry, Drainage, Discharge (Water).
Identifiers: *USSR, *Latvian SSR, Baltic Sea, Gulf of Riga, Mineralization, Water exchange, Regionalization, Zonality, Tectonics.

This monograph consisting of 6 chapters is devoted to a study of groundwater formation patterns and the interrelationship of surface- and groundwaters in the Latvian SSR. Special emphasis is placed on the importance of Quaternary aquifer complexes in the formation and distribution of groundwater resources from the standpoint of their utilization by various branches of the national economy. Based on the thickness of the Quaternary deposits, two hydrogeological areas, subdivided into 26 geomorphological regions, were distinguished in the Republic: (1) the supramoraine deposits associated with depressions; and (2) the intra- and submoraine deposits identified with elevations. A proposed hydrogeological division of the Latvian SSR into 4 relatively closed circulation systems is based on the hydrogeological characteristics of the Quaternary deposits and on the groundwater dynamics in the upper sedimentary layer. (Josefson-USGS)
W71-12607

GAS AND SALT COMPOSITIONS AND AGE OF GROUNDWATERS OF THE CASPIAN SEA DEPRESSION (Gazovyy i solevoy sostav i vozrast podzemnykh vod Prikaspiyskoy vpadiny),
L. M. Zor'kin, and Ye. V. Stadnik.
Akademiya Nauk SSSR Doklady, Vol 195, No 5, p 1187-1189, 1970. 1 fig, 2 tab, 8 ref.

Descriptors: *Groundwater, *Gases, *Salts, *Age, *Hydrogeology, Sedimentary rocks, Aquifers, Geologic time, Water types, Water quality, Confined water, Bicarbonates, Sodium sulfate, Chlorides, Magnesium, Calcium chloride, Argon, Helium, Methane, Nitrogen.
Identifiers: *USSR, Caspian Sea, Mineralization, Bromine, Iodine, Magnesium chloride.

The sedimentary rocks of the Caspian Sea Depression contain many aquifer complexes, which may be divided into three hydrogeological levels: upper (Neogene-Quaternary), middle (Upper Permian-Mesozoic) and lower (subsalt). Total mineralization of the artesian waters of the upper level increases from 5-10 meg/liter in the outlying areas of the basin to 8,500-9,000 meq/liter in the inland regions. This increase is accompanied by a change in the chemical quality of the waters from a sodium bicarbonate and sodium sulfate salinity to a magnesium chloride and calcium chloride type. The composition of the dissolved gases changes from nitrogen and methane-nitrogen in the outlying regions of the basin to methane in the central parts. The age of the gases corresponds to the age of the country rocks. Total mineralization of the waters of the middle layer increases from 50-100 meq/liter in the outlying area to 9,000-10,000 meq/liter or more in the inland regions. The waters are of the calcium chloride, sodium sulfate, sodium bicarbonate and magnesium chloride type. The gas in the eastern half of the depression and along its outskirts is nitrogen and in waters of the Upper Permian-Triassic complex, methane. The age of the gases ranges from 10-50 million years in waters of the Jurassic and Cretaceous deposits to 100-150 million years or more in the Permian-Triassic deposits. The waters of the subsalt layer contain calcium chloride brines with a mineralization of more than 6,000-8,000 meq/liter. The gas is exclusively methane and its age generally exceeds 150-200 million years. (Josefson-USGS)
W71-12608

THE KERCH-TAMAN HYDROGEOCHEMICAL AND MUD VOLCANIC REGION (O Kerchensko-Tamanskoy gidrogeokhimicheskoy i gryazevulkanicheskoy oblasti),
Sevastopol Inst. of Instrument Making, Sevastopol (USSR).
For primary bibliographic entry see Field 02K.
W71-12613

HYDROLOGIC RECONNAISSANCE OF THE PARK VALLEY AREA, BOX ELDER COUNTY, UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 02E.
W71-12615

NUCLEAR WELL LOGGING IN HYDROLOGY.

UNIPUB, Inc, PO Box 433, NY, NY 10016 - $3.00.
International Atomic Energy Agency Technical Report Series No 126, Vienna, 1971. 90 p.

Descriptors: *Radioactive well logging, *Aquifer characteristics, *Boreholes, *Tracers, *Gamma rays, Analytical techniques, Hydrogeology, Groundwater movement, Geology.
Identifiers: *Gamma logging, *Neutron logging, *Tracer logging.

Nuclear logging, along with other borehole geophysical methods, was developed primarily by the petroleum industry for use in exploration and developmental work. The information in this report shows that nuclear logging may also be useful in hydrology. Qualitative - and under proper conditions quantitative - interpretations about the physical, chemical, petrographic and hydraulic properties of formations and their contained fluids can be made from nuclear logs. The methods of nuclear well logging (discussed by various authors) include natural gamma logging, gamma-gamma logging, neutron logging, and tracer logging. (See also W71-12617 thru W71-12620) (Woodard-USGS)
W71-12616

LOGGING METHODS - A. NATURAL GAMMA LOGGING,
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
V. I. Ferronsky.
In: International Atomic Energy Agency Technical Report Series No 126, Chapter 2, p 22-26, Vienna, 1971. 3 tab.

Descriptors: *Aquifer characteristics, *Radioactive well logging, *Boreholes, *Gamma rays, Radioisotopes, Hydrology, Data collections, Analytical techniques, Instrumentation, Geology.
Identifiers: *Natural gamma logging.

Natural gamma logging is the most widely used of the nuclear logs. In hydrology, it is used mainly for lithological identification, stratigraphic correlations, determination of the clay content of rocks, and estimation of permeability and porosity. Natural gamma spectrometry shows promise for hydrological work because it could be used for detailed stratigraphic correlations on the basis of characteristic radioactive mineral assemblages and for differentiating types of clays present. Tables

show some of the main physical characteristics of natural radioactive isotopes, natural radioactivity of magnetic rock, and content of radioactive elements in some types of sedimentary rocks. (See also W71-12616) (Woodard-USGS)
W71-12617

LOGGING METHODS - C. NEUTRON LOGGING,
Institute of Nuclear Research. Krakow (Poland).
J. A. Czubek.
In: International Atomic Energy Agency Technical Report Series No 126, Chapter 2, p 32-42, Vienna, 1971. 7 fig, 1 tab.

Descriptors: *Radioactive well logging, *Aquifer characteristics, *Nuclear meters, *Boreholes, *Neutron absorption, Gamma rays, Instrumentation, Analytical techniques, Hydrology, Geology.
Identifiers: *Neutron logging.

Numerous logging methods are based on the nuclear interactions occurring during the slowing-down and diffusion of neutrons in rock media. The basic neutron probe usually employs a neutron source (isotope or generator type) and a detector selected for the neutron interaction to be investigated. The possible neutron logging methods are given in the order of the neutron's history after its emission from a neutron source. Neutron-logging methods are used for quantitative measurements of porosity, specific yield of unconfined aquifers, moisture content, and other parameters. The pulsed neutron-epithermal neutron lifetime and neutron-thermal neutron lifetime are the most sensitive of all neutron logs to the mineralization of the water saturating a formation. They are highly sensitive to variations in the NaCl content of the water. Formations with mineralized water can be differentiated from freshwater formations in wells if the mineralization exceeds 5% in respect of NaCl at 20% formation porosity. (See also W71-12616) (Woodard-USGS)
W71-12618

LOGGING METHODS - B. GAMMA-GAMMA LOGGING,
Institute of Nuclear Research. Krakow (Poland).
J. A. Czubek.
In: International Atomic Energy Agency Technical Report Series No 126, Chapter 2, p 26-32, Vienna, 1971. 4 fig.

Descriptors: *Radioactive well logging, *Aquifer characteristics, *Boreholes, *Gamma rays, *X-ray fluorescence, Instrumentation, Analytical techniques, Hydrology, Data collections, Geology.
Identifiers: *Gamma-gamma logging.

The application of gamma-ray sources to borehole logging is limited to four principal methods: Gamma-gamma density logging; gamma-gamma selective logging; photon-neutron logging; and X-ray fluorescence logging. For hydrological purposes, only the gamma-gamma density and gamma-gamma spectrometric logs are of interest. Photon-neutron and X-ray fluorescence logging mainly have applications for mineral investigations. A simplified sketch shows the physical principles of these logs. The gamma-gamma density log has many well-construction uses. It can be used to locate casing, collars and one string of casing outside another. It also can be used to locate the position of cement, hole enlargements, water levels and changes in fluid density behind the casing. (See also W71-12616) (Woodard-USGS)
W71-12619

LOGGING METHODS - D. TRACER LOGGING,
Bhabha Atom Research Centre, Bombay (India).
K. Krishnamurthy, and S. M. Rao.
In: International Atomic Energy Agency Technical Report Series No 126, Chapter 2, p 43-49, Vienna, 1971. 5 fig.

Descriptors: *Radioactive well logging, *Aquifer characteristics, *Tracers, *Gamma rays, Groundwater movement, Aquifers, Analytical techniques, Hydrogeology, Boreholes.
Identifiers: *Tracer logging.

Tracer-logging techniques provide a means of directly examining fluid dynamics in situ. Although equipment requirements are similar to other nuclear logging methods, tracer logging has the additional requirements of: (1) procuring suitable tracers in adequate quantities; and (2) handling radioactive tracers under field conditions. Tracers used in nuclear logging work, in addition to being suitable for use in water, should also be amenable to in-situ detection and measurement under borehole conditions. Radioactive tracers, particularly the high-energy gamma emitters, are eminently suited and are widely used. Short-lived gamma emitters such as bromine-82, iodine-131, chromium-51-EDTA, and gold-198 are usually chosen because borehole tracer studies are essentially short range in nature. An exception is tritium; for its detection, a water sample must be collected and analyzed in the laboratory. Certain non-radioactive tracers can be detected in situ by one of several nuclear reactions; among these are deuterium and cadmium salts. (See also W71-12616) (Woodard-USGS)
W71-12620

THE 'EIN NA'AMAN SPRINGS AND THE AQUIFER FEEDING THEM,
Ministry of Agriculture, Jerusalem (Israel). Hydrological Service.
M. J. Goldschmidt.
Israel Hydrological Service, Hydrological Paper no 13, 1970. 33 p, 7 fig, 6 tab, 39 ref.

Descriptors: *Groundwater movement, *Springs, *Aquifers, *Hydrogeology, Water yield, Water quality, Groundwater recharge, Aquifer characteristics, Salinity, Groundwater, Hydrologic data.
Identifiers: *'Ein Na'aman Springs (Israel), *Israel.

The hydrological and the hydro-geochemical regimens of the undisturbed flow of the 'Ein Na'aman springs in Israel and of the groundwater in the aquifer feeding the springs are described. A paleohydrological model was designed to explain the hydro-geochemical regimen. A geological outline map and geological section from the Mediterranean Sea to the aquifer recharge area show hydrological controls. Drawings show the salinity pattern of springs, the groundwater flow pattern, total annual flow by years (9144-1965), and characteristic ions along the geologic section. Since drainage of the swampy spring area in the 1940's, the total mean annual combined flow is about 1.48 cu m/sec and the mean salinity about 628 mg/liter of Cl. (Woodard-USGS)
W71-12623

GROUND WATER - THE GREAT LAKES BASIN'S HIDDEN RESOURCE,
Geological Survey, Madison, Wis. Water Resources Div.
Roger M. Waller.
Communicator, Vol 1, No 11, p 3-4, May 1971. 2 p.

Descriptors: *Groundwater, *Great Lakes Region, *Reviews, Glacial drift, Aquifers, Hydrogeology, Groundwater basins, Water resources development, Water quality.
Identifiers: Groundwater resource.

Groundwater is used as a water supply in many areas of the Great Lakes but has largely been ignored in others. Groundwater is present everywhere in the basin, but its quantity and quality differ considerably from place to place and with depth. Where groundwater is being developed, management of the resource is almost wholly lacking, principally because of the hidden nature of groundwater and the lack of knowledge of its relationship to surfacewater. Recent studies, however, are uncovering the great potential of this hidden resource. The basin is unique in that it comprises most of the glaciated portion of the conterminous United States. Groundwater is present in permeable zones in the unconsolidated rock - the glacial drift and alluvium - and in the underlying bedrock. The chemical quality of water in the sand and gravel aquifer is generally very good. Where carbonate-rich sediments are present, solution of the carbonate material commonly makes the groundwater hard. The chemical quality of the bedrock water is highly variable. The mineral content generally increases with increasing depth in the aquifer. Locally, high sulfate, chloride, iron, or other mineral content causes problems. (Knapp-USGS)
W71-12626

WATER LEVEL SURFACES IN THE AQUIFERS OF WESTERN LONG ISLAND, NEW YORK, IN 1959 AND 1970,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 04C.
W71-12675

AVAILABILITY OF GROUND WATER FROM LIMESTONE AND DOLOMITE AQUIFERS IN NORTHWEST OHIO AND ITS RELATION TO GEOLOGIC STRUCTURE,
Geological Survey, Columbus, Ohio.
S. E. Norris, and R. E. Fidler.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B229-B235, 1971. 4 fig, 6 ref.

Descriptors: *Hydrogeology, *Ohio, *Limestones, *Aquifers, *Water yield, Transmissivity, Permeability, Karst, Aquifer characteristics, Structural geology, Paleohydrology, Groundwater movement.
Identifiers: Cincinnati Arch (Ohio).

Potentially, the largest groundwater supplies in northwest Ohio are available from limestone and dolomite aquifers in a long, striplike area 7 to 18 miles wide along the flanks of the Cincinnati arch, a regional structural feature. The conditions conducive to high water yield resulted from groundwater solution of rocks during periods of emergence of the arch at times in the geologic past ranging from Mississippian to Recent times. A detailed geologic structure map is based on interpretation of geophysical logs. The top of the Middle Silurian Lockport Dolomite is defined and shows the location of the arch in the 20-county study area. (Knapp-USGS)
W71-12676

PRELIMINARY CONSIDERATION OF MOVEMENT OF GROUND WATER FROM INFILTRATION AREAS ON THE LLANO ESTACADO, TEXAS AND NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
C. V. Theis.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B236-B243, 1971. 4 fig.

Descriptors: *Groundwater recharge, *Infiltration, *Canal seepage, *Pit recharge, *Hydrogeology, Water resources development, Groundwater movement, Inter-basin transfers, Texas, Permeability, Transmissivity, Artificial recharge, Mathematical models.
Identifiers: Ogallala Formation (Tex).

Consideration of several theoretical models indicates that infiltration canals on the Llano Estacado would probably have to be about 6 or 7 miles apart on the average to provide all parts of their service area with water for groundwater recharge. Infiltration ponds or lakes, involving radial movement of water, would be somewhat closer--

on the average about 3 or 4 miles apart. These figures are based on equilibrium models assuming either constant hydraulic conductivity vertically and laterally or constant transmissivity. It is also assumed that the aquifer is isotropic. For the average hydrological condition in this area a conductivity of 10,000 feet per year (equivalent to a Meinzer coefficient of permeability of about 200 gpd/sq ft) or a transmissivity equivalent to 30,000 gpd/ft has been assumed. In areas where these assumed estimates are exceeded, infiltration canals or ponds could be more widely spaced; conversely, in areas where conductivity and transmissivity fall below these assumed averages, infiltration structures should be closer together. (Knapp-USGS)
W71-12677

ORIGIN OF MINERALIZED GROUND WATER IN PROCKS, NORTHEAST BRAZIL,
Geological Survey, Washington, D.C.
S. L. Schoff.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B244-B247, 1971. 2 fig, 12 ref.

Descriptors: *Water quality, *Groundwater, *Saline water, *Water circulation, *Leaching, Water chemistry, Saline water systems, Weathering, Provenance, Sea water, Connate water, Water wells, Aquifers, Geochemistry.
Identifiers: *Brazil.

The upper Rio Paraibo basin, northeast Brazil, an area of about 12,000 square kilometers, has groundwater ranging in dissolved solids from about 350 to 25,000 milligrams per liter. It is underlain by crystalline bedrock of Precambrian age, and saprolite and alluvium derived from it. The crystalline rocks are types that usually yield water of excellent chemical quality. The common concept that fresh water enters the rocks and is becoming progressively more mineralized through contact with the rocks and concentration through evaporation seems not to be tenable in the area studied. The saline water probably originated as sea water and is being slowly and unevenly diluted and drained out of the rocks. (Knapp-USGS)
W71-12678

REGIONAL SPECIFIC YIELD OF COAMO FAN, PUERTO RICO, COMPUTED BY WATER-BUDGET METHOD,
Geological Survey of Puerto Rico, San Juan.
E. V. Giusti.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Ofhington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B248-B251, 1971. 5 fig, 1 tab, 1 ref.

Descriptors: *Specific yield, *Alluvium, *Aquifer characteristics, *Return flow, *Water balance, Evapotranspiration, Irrigation water, Water yield, Water wells, Hydrogeology, Hydrologic budget, Puerto Rico, Withdrawal.
Identifiers: *Alluvial fans, Aquifer evaluation.

A regional value of 0.16 for specific yield was computed by the water-budget method for the Coamo alluvial fan in southern Puerto Rico for calendar year 1967. This method may be used where dewatering of the aquifer is a major component of the water budget and where infiltration from rainfall and surface water is negligible or its effect can be calculated. For the Coamo fan, which is irrigated for agriculture, an average of one-third of the irrigation water was recirculated through the aquifer during the study year 1967. (Knapp-USGS)
W71-12679

EARTHQUAKE-ACCELERATED DECLINE OF WATER LEVEL IN AN OBSERVATION WELL IN ST. THOMAS, VIRGIN ISLANDS,
Geological Survey of Puerto Rico, San Juan.
T. M. Robison.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B252-B253, 1971. 2 fig, 1 ref.

Descriptors: *Water level fluctuations, *Water wells, *Aquifers, *Earthquakes, *Virgin Islands, Hydrogeology, Water levels, Recharge, Water balance, Withdrawal, Fractures (Geology).

A minor local earchquake caused a precipitate decline in the water level of an observation well in St. Thomas, Virgin Islands. The decline continued for over 3 months. The cause of the decline is assumed to be fracturing of the aquifer. Fracturing of the volcanic aquifer that underlies the alluvium, increased its ability to transmit water, enabling the groundwater in the vicinity to seek a lower level more readily. On July 3, 1968, about 3 months after the earthquake, the water level reached 16.58 feet below land surface, an all-time low for the well. The total decline since the earthquake had been 2.63 feet. Recovery began on July 4. The recovery is attributable to heavy rains which ended a prolonged period of low rainfall. (Knapp-USGS)
W71-12680

A METHOD OF CALCULATING PERMEABILITY FROM ELECTRIC LOGS,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 07B.
W71-12683

THE USE OF WELL LOGGING IN RECHARGE STUDIES OF THE OGALLALA FORMATION IN WEST TEXAS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 04B.
W71-12684

A DIMENSIONLESS PARAMETER STUDY OF GROUNDWATER RECHARGE IN OKLAHOMA,
Oklahoma Univ. Research Inst., Norman.
A. Bagdadipour, J. F. Harp, and J. G. Laguros.
Available from the National Technical Information Service as PB-202 872, $3.00 in paper copy, $0.95 in microfiche. Oklahoma University Research Institute Final Project Report 1779, June 1971. 35 p, 10 fig, 5 tab, 13 ref. OWRR A-027-OKLA (1).

Descriptors: *Groundwater recharge, *Mathematical models, *Regression analysis, Oklahoma, Hydrologic data, Rainfall, Water wells, Pumping, Aquifer characteristics, Water yield, Hydrogeology, Model studies.
Identifiers: *Groundwater hydrogeology (Okla).

A mathematical model relating groundwater recharge rate to all other factors which affect it is presented. The parameters of well and recharge hydraulics were grouped into three dimensionless terms which, in turn, were correlated to each other using multiple regression analysis. The field data used related to a number of city-owned wells and provided information concerning the static head readings of the wells, the depth of the wells, the amount of pumpage, soil characteristics, location of wells, and the rainfall intensities. (Woodard-USGS)
W71-12697

WATER WELLS IN THE SAN LUIS REY RIVER VALLEY AREA, SAN DIEGO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W71-12790

GEOHYDROLOGY OF DONIPHAN COUNTY, NORTHEASTERN KANSAS,
Kansas State Geological Survey, Lawrence.
Charles K. Bayne.
Geological Survey Open-file Report, 1971. 21 p, 7 fig, 2 plate, 1 tab, 13 ref.

Descriptors: *Groundwater, *Hydrogeology, *Water wells, *Hydrologic data, *Kansas, Water supply, Water quality, Water yield, Water users, Aquifer characteristics, Maps.
Identifiers: *Groundwater resources, *Doniphan County (Kans).

Data concerning groundwater resources in Doniphan County, Kansas are presented. Adequate supplies of water for domestic and stock use generally are available from wells in the glacial deposits underlying the upland areas of Doniphan County. Adjacent to the major streams, the glacial deposits are thin or have been removed by erosion. In these localized areas, small supplies of water are available from wells drilled into bedrock aquifers. Large supplies of water are available only from wells in alluvial deposits in the Missouri River valley. Groundwater in Doniphan County is of the calcium bicarbonate type. The concentration of dissolved solids in water from wells ranges from 114 to 767 mg/liter. Concentrations of individual mineral constituents were below the U.S. Public Health Service recommended maximum, except those for nitrate and iron, which in some samples exceeded recommended maximums by 45 mg/liter and 0.3 mg/liter, respectively. (Woodard-USGS)
W71-12795

SUBSIDENCE IN THE BUNKER HILL-SAN TIMOTEO AREA, SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. E. Miller, and J. A. Singer.
Geological Survey Open-file Report, January 29, 1971. 28 p, 17 fig, 2 tab, 16 ref.

Descriptors: *Land subsidence, *Groundwater, *Withdrawal, *Water level fluctuations, *California, Hydrologic data, Aquifer characteristics, Groundwater recharge, Pumping, Water table, Forecasting.
Identifiers: *Bunker Hill-San Timoteo Area (Calif).

The effect of groundwater withdrawals are related to land surface subsidence in the Bunker Hill-San Timoteo area, California, is presented. The aquifer system consists of poorly consolidated alluvial sediments ranging in thickness from about 100 to 1,200 feet. Maximum measured subsidence in the area has been 1.0 foot. Subsidence rates show a close correlation to water-level declines in wells. A contour map showing subsidence per foot of water-level decline was constructed. Land-surface subsidence of as much as 4 feet has been predicted for the area for the period 1965 to 2015 on the basis of postulated water-level declines. Damage to drains, sewers, flood-control structures, and pipelines could result from the predicted subsidence. Subsidence in the area could be halted by a permanent recovery of water levels. The best method of minimizing subsidence would be to develop a pumping pattern that would distribute the drawdown effect more evenly across the study area. (Woodard-USGS)
W71-12796

A BUBBLER-MANOMETER WATER LEVEL SENSING AND RECORDING SYSTEM,
Saskatchewan Research Council, Saskatoon.
For primary bibliographic entry see Field 07B.
W71-12805

OPTIMAL IDENTIFICATION OF AQUIFER DIFFUSIVITY USING QUASILINEARIZATION,
California Univ., Los Angeles.
W. W-G. Yeh, and G. W. Tauxe.
Water Resources Research, Vol 7, No 4, p 955-962, August 1971. 6 fig, 4 tab, 12 ref.

Descriptors: *Groundwater movement, *Diffusivity, *Surface-groundwater relationships, Numerical analysis, Parametric hydrology, Mathematical models, Mathematical studies, Dupuit-Forchheimer theory, Linear programming, Optimization, Hydrographs, Stage-discharge relations.
Identifiers: *Parameter identification.

An analytical procedure is presented to solve the problem of identifying aquifer diffusivity in an unconfined aquifer and stream interaction system using the fluctuation of the aquifer head in response to a flood wave as data. The governing nonlinear partial differential equation is replaced by a system of nonlinear ordinary differential equations to which the technique of quasilinearization is applied. The procedure is straightforward and converges quadratically. It requires neither graphical matching nor trial and error manipulations. Numerical experiments are presented and compared with published experimental data. (Knapp-USGS)
W71-12808

MEASUREMENT OF VERTICAL GROUNDWATER VELOCITY FROM TEMPERATURE PROFILES IN WELLS,
Geological Survey, Denver, Colo. Water Resources Div.
M. L. Sorey.
Water Resources Research, Vol 7, No 4, p 963-970, August 1971. 8 fig, 14 ref.

Descriptors: *Groundwater movement, *Geothermal studies, *Temperature, *Borehole geophysics, *Instrumentation, Colorado, New Mexico, Velocity, Observation wells, Heat flow.
Identifiers: Vertical groundwater movement.

Vertically moving groundwater transports heat by convection and causes curvature in the earth's thermal profile. Dimensionless plots of the temperature distribution in wells can be matched with published type curves to obtain solutions for vertical groundwater velocity, if the thermal conductivity of the solid-fluid complex is known or can be estimated. Rates of upward movement through semiconfining beds determined from temperature studies in the San Luis valley of Colorado and the Roswell basin of New Mexico were in good agreement with rates computed form pumping tests and water budget methods. Limitations of the method result from instability in borehole fluids, measurement detail required, and magnitudes of flow that can be detected. (Knapp-USGS)
W71-12809

SEAWATER INTRUSION IN LAYERED AQUIFERS,
Southern Methodist Univ., Dallas, Tex. Inst. Tech.
M. A. Collins and L. W. Gelhar.
Water Resources Research, Vol 7, No 4, p 971-979, August 1971. 5 fig, 25 ref.

Descriptors: *Mathematical models, *Saline water intrusion, *Aquifers, *Aquitards, *Confined water, Saline water-freshwater interfaces, Hydraulic models, Groundwater movement.
Identifiers: *Long Island (N Y).

Seawater intrusion beneath a semipervious layer in a two-layer coastal aquifer system is described. Freshwater can occur beneath the aquitard because of the head losses induced by upward flow through the semipervious layer. A steady state Dupuit model is formulated to predict the piezometric head variation landward of and above the intruding seawater. Exact solutions are given for the landward head variation, but a numerical solution is necessary for the zone above the intruding seawater. The mathematical model is compared to experimental results of a Hele-Shaw model study of Long Island, New York. The analysis provides reasonable predictions of the shape of the interface between freshwater and seawater, but the location of the toe of the seawater wedge is inadequately described, apparently because of regional flow conditions on the island that are not simulated in the analysis. (Knapp-USGS)
W71-12810

COMMENTS ON THE STABLE ISOTOPE METHOD IN REGIONAL GROUNDWATER INVESTIGATIONS,
International Atomic Energy agency, Vienna (Austria).
J. R. Gat.
Water Resources Research, Vol 7, No 4, p 980-993, August 1971. 4 fig, 43 ref.

Descriptors: *Stable isotopes, *Oxygen, *Deuterium, *Groundwater movement, Groundwater basins, Tracers, Tracking techniques, Surveys, Reviews, Mixing, Water chemistry, Hydrogeology, Provenance, Statistics, Regional analysis.
Identifiers: Isotope hydrogeology.

Comparison of natural variations of oxygen 18 and deuterium abundances in groundwaters to those of the local precipitation may be used as a hydrologic tool. The residual scatter in time and space of the isotope content of groundwater sources is a measure of the homogeneity of these systems rather than of their age or size. The concept of a regional slope of evaporation lines on deuterium vs 0-18 diagrams, has only limited validity. Isotope criteria are suggested for distingushing rainfall from past climatic periods. As a result of the unsteady nature of the mechanisms affecting the isotope composition of groundwaters, their most reliable use under the limitations of our present quantitative knowledge on the causes of this scatter is as classifying parameters in regional investigations. (Knapp-USGS)
W71-12811

HYDROGEOLOGY OF ASH FLOW TUFF: A PRELIMINARY STATEMENT,
Arizona Univ., Tucson. Dept. of Geosciences.
I. J. Winograd.
Water Resources Research, Vol 7, No 4, p 994-1006, August 1971. 6 fig, 1 tab, 29 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Pumice, *Igneous rocks, *Permeability, Transmissivity, Lava, Confined water, Fractures (Geology), Joints (Geology), Porosity, Aquitards, Aquifers, Surveys, Reviews, Mapping.
Identifiers: *Volcanic ash, *Tuff.

Ash flow tuffs cover tens of thousands of square miles in the south-western states. In contrast to silicic lava flows but similar to basalts, ash flow tuffs are sheetlike bodies; individual flows can be traced for as much as 100 miles. Welding, the cohesion of molten glassy shards and pumice fragments during emplacement of these rocks, results in significant vertical variations in physical properties within individual flows. Interstitial porosity and permeability vary from 70% and 2 gpd/sq ft, respectively, in nonwelded portions or zones of ash flows to less than 5% porosity and virtually zero permeability in densely welded zones. Primary and secondary joints spaced several feet apart in nonwelded zones are as close as a fraction of an inch in densely welded zones. Fracture transmissibility of welded zones within ash flow tuffs varies from 100-100,000 gpd/ft. The nonwelded zones are aquitards. Spring groups with discharges ranging from 20-200 cfs emerge from welded tuff in eastern Idaho and in Sumatra, Indonesia. The magnitude of the spring discharge shows the regional hydraulic continuity of these strata. Development of groundwater from welded tuff in the Southwest appears to be several decades away because of depth of burial, large variations in yield, and locally poor water quality. (Knapp-USGS)
W71-12812

GROUNDWATER CHEMISTRY AND HYDROLOGY OF THE HANDHILLS LAKE AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 02K.
W71-12820

SIMILITUDE CRITERIA FOR FLOW FROM UNCONFINED AQUIFERS,
Cornell Univ., Ithaca, N.Y.
R. D. Verma, and W. Brutsaert.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, Paper 8397, p 1493-1509, September 1971. 10 fig, 1 tab, 18 ref, 2 append.

Descriptors: *Groundwater movement, *Capillary action, Darcys law, Dupuit-Forchheimer theory, Aquifer characteristics, Seepage, Saturated flow, Hydrogeology, Hydraulic similitude, Hydraulic models, Water table, Aquifers.
Identifiers: Unconfined aquifers.

Seepage in a two-dimensional unconfined aquifer of rectangular cross section was analyzed to determine the rate of outflow into an adjoining water body which fully penetrates the aquifer. The analysis was made by using capillary flow theory as well as saturated Darcy flow theory with and without the Dupuit assumptions. In addition to the usual criteria of similarity of geometry, initial and boundary conditions, also the relative capillary conductivity and the dimensionless water content suction relationship must be similar. A convenient parameter was formulated which expresses the effect of capillarity in relation to the depth of the aquifer. This parameter is useful to determine whether or not the capillary flow above the water table is important. The errors that may arise in the prediction of the outflow rate by neglecting capillarity and using the Dupuit assumptions are described. (Knapp-USGS)
W71-12840

COMPUTER ANALYSIS OF FLOW TOWARD ARTESIAN WELLS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
Y. H. Huang.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, p 1579-1584, September 1971. 4 fig, 5 ref.

Descriptors: *Mathematical models, *Groundwater movement, *Numerical analysis, *Artesian wells, *Confined water, Theis equation, Drawdown, Withdrawal, Discharge (Water), Isotropy, Computer programs.
Identifiers: Finite difference method.

A finite difference method programmed for a high speed computer may be used for the analysis of unsteady flow toward fully and partially penetrating artesian wells. A graded network makes possible the application of the method to an aquifer of infinite extent. A comparison of the numerical solutions with those based on the closed form formulas of Muskat, Theis, and Hantush shows the validity of the method. Although axisymmetry, elasticity, homogeneity and isotropy were assumed, a major advantage of the numerical method is that it can be extended to cases involving asymmetric, inelastic, nonhomogeneous, and anisotropic aquifers as well. (Knapp-USGS)
W71-12841

2G. Water in Soils

MODEL STUDY TO PREDICT SALT DISTRIBUTION AND CONCENTRATION OF WATER IN SOIL PROFILES,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
Jose F. Alfaro, and D. W. Wilkins.
Available from the National Technical Information Service as PB-202 631, $3.00 in paper copy, $0.95 in microfiche. New Mexico State University Project Completion Report, December 1970. 14 p, 4 fig. OWRR A-016-NMEX (2).

Descriptors: *Soil water, *Saline soils, *Salts, *Soil profiles, *Model studies, Salinity, Forecasting, Water quality, Analytical techniques, New Mexico.

The effluent concentration curves of homogeneous and stratified soil profiles were satisfactorily predicted from results obtained by leaching a scaled model which met theoretical requirements. The salt distribution within a homogeneous soil profile, at the moment the wetting first reached the bottom was predicted from the effluent concentration data obtained from a similar profile. Also, the effluent

concentration curve from leading a uniform soil profile was predicted from the salt distribution within the profile. Laboratory results suggest that modeling profiles according to the design conditions specified by the theory can be useful in predicting quality changes of irrigation return flows. (Woodard-USGS)
W71-12247

ESTIMATING SOIL PERMEABILITY RATES,
Harza Engineering Co., Chicago, Ill. Land Resources Div.
M. E. Horn.
ASCE Proceedings, Journal of the Irrigation and Drainage Division, Vol 97, No L R-2, Paper 8169, p 263-274, June 1971. 3 fig, 6 tab, 8 ref.

Descriptors: *Permeability, *Soil water movement, *Seepage, *Estimating, *Particle size, Clays, Silts, Sands, Hydraulic conductivity, Soil chemical properties, Soil texture, Sampling, Soil mechanics.
Identifiers: Permeability estimation.

A guide for estimating soil permeability rates was developed based on mean soil particle diameters. The method takes into account the wide ranges within commonly used soil textural classes and the influence of soil chemical properties, clay mineralogy, and other related factors affecting soil permeability. Curves plotted on a log-log graph of soil texture versus permeability establish graphically the general limits of permeability rates for natural soils. Considerations in selecting working curves that relate soil texture and permeability rates for local conditions are also discussed. Permeability rates are estimated in planning and designing irrigation and drainage systems when obtaining actual field measurements is difficult and impractical, or the data available are scant and misleading. (Knapp-USGS)
W71-12249

PROPERTIES OF TILE DRAINAGE WATER,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W71-12252

A TEST OF THE UNIQUENESS OF THE SOIL MOISTURE CHARACTERISTIC DURING TRANSIENT, NONHYSTERETIC FLOW OF WATER IN A RIGID SOIL,
Sydney Univ. (Australia). Dept. of Soil Science.
D. E. Smiles, G. Vachaud, and M. Vauclin.
Soil Science Society of America Proceedings, Vol 35, No 4, p 534-539, July-August 1971. 7 fig, 3 tab, 14 ref.

Descriptors: *Soil water movement, *Moisture content, *Unsteady flow, Porous media, Bulk density, Moisture tension, Tensiometers, Soil moisture meters, Nuclear moisture meters, Hysteresis.
Identifiers: Soil moisture characteristic.

During transient, nonhysteretic flow of water caused by a rapid change of water content at one end of a horizontal column of soil, the soil moisture characteristic curve is a unique function of sorption from a particular initial water content, but for desorption there is a multiplicity of curves. These transient curves depend on the magnitude of the imposed water content change and on the speed with which static equilibrium is achieved. (Knapp-USGS)
W71-12265

SOIL WATER EVAPORATION: REDUCTION BY SIMULATED TILLAGE,
Agricultural Research Service, Mandan, N.D. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 03B.
W71-12266

DETERMINATION OF CATION EXCHANGE CAPACITY OF EARTH MATERIALS USING A RADIOTRACER TECHNIQUE,
Cold Regions Research and Engineering Lab., Hanover, N.H. Earth Sciences Branch; and Dartmouth Coll., Hanover, N.H. Dept. of Geology.
R. P. Murrmann, R. C. Reynolds, and D. Leggett.
Cold Regions Research and Engineering Laboratory Research Report 283, February 1970. 12 p, 1 fig, 7 tab, 4 ref, append.

Descriptors: *Soil analysis, *Cation exchange, *Radioisotopes, *Tracers, Analytical techniques, Methodology, Clay minerals, Solutes.
Identifiers: *Cation exchange capacity, Isotope exchange.

Two radiochemical methods were investigated for determining the cation exchange capacity of earth materials having a wide range in physicochemical properties. The first method was unsuccessful but involved determination of the radioactivity of a 22Na-NaOAc solution of isotopic equilibrium with a sodium-saturated mineral phase. The logic of this method is presented in order to illustrate principles of isotopic exchange in mineral systems. The method adopted is based upon determination of the radioactivity of a salt-free, sodium-saturated mineral sample prepared using a radioactive NaOAc solution with a known 22Na-NaOAc composition. This method is less time-consuming and more accurate than the conventional ammonium acetate method for cation exchange capacity determinations. (Woodard-USGS)
W71-12272

THE INFLUENCE OF CLAYS ON WATER AND ICE IN ROCK PORES, PART 1. QUANTITATIVE COLD DIFFERENTIAL THERMAL ANALYSIS,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Geology.
For primary bibliographic entry see Field 02C.
W71-12281

SNOW COVER AND WINTER SOIL TEMPERATURES AT ST. PAUL, MINNESOTA,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 02C.
W71-12319

CHAPTER 3. CHEMICAL, PHYSICAL, AND BIOLOGICAL CHARACTERISTICS OF IRRIGATION AND SOIL WATER,
Department of Agriculture, Riverside, Calif., Salinity Lab.
For primary bibliographic entry see Field 02A.
W71-12350

DESCENT RATES OF SALT FINGERS,
Wisconsin Univ., Milwaukee. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07B.
W71-12359

TRANSIENT AND STEADY TWO-DIMENSIONAL FLOW OF WATER IN UNSATURATED SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
H. M. E. Selim.
PhD Thesis, 1971. 101 p, 50 fig, 34 ref. OWRR Project A-026-IOWA (5).

Descriptors: *Soil water movement, *Steady flow, *Unsteady flow, Theoretical analysis, Numerical analysis, Equations, Mathematical studies, Diffusion, Flow rates, Unsaturated flows.
Identifiers: *Transient flow.

Equations for transient and steady-state two-dimensional water flow for unsaturated soils are solved using the finite difference approximations of numerical analysis. The equation for transient water flow is solved by use of an alternating-direction method. The equation for steady-state water flow is solved by a successive overrelaxation method. The two-dimensional flow medium considered in this theoretical problem is a homogeneous soil with an impervious barrier (or a groundwater table) at some depth from soil surface and equally spaced trenches (or irrigation furrows and ridges) to which water is supplied. In the steady-state, equal soil water content lines of high water contents extend to the impervious barrier, and high water gradients occur at the soil surface boundaries. In the presence of a groundwater table, steady-state water fluxes are negative (downward). These fluxes indicate that in a steady state a groundwater table is a water sink rather than a source of water. Results of the transient and the steady-state water flow show that as time increases the transient flow approaches that of the steady state. (Woodard-USGS)
W71-12364

GEOMORPHOLOGICAL RELATIONSHIPS OF TROPOSPHERICALLY DERIVED QUARTZ IN THE SOILS OF THE HAWAIIAN ISLANDS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02J.
W71-12375

FIELD MEASUREMENT OF SOIL-WATER CONTENT BY GAMMA-RAY TRANSMISSION COMPENSATED FOR TEMPERATURE FLUCTUATIONS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. J. Reginato, and R. D. Jackson.
Soil Science Society of America Proceedings, Vol 35, No 4, p 529-533, July-August 1971. 5 fig, 1 tab, 13 ref.

Descriptors: *Soil moisture meters, *Nuclear moisture meters, Gamma rays, Bulk density, Temperature, Calibrations, Instrumentation, Moisture meters, Moisture content, Soil moisture.

Soil water content under natural field conditions was measured with a gamma-ray transmission technique that compensated for temperature changes. A spectrum stabilizer was needed for the nuclear counting equipment, and a knowledge of the relationship between peak count-rate and the temperature of the gamma-ray detector probe was required. Equipment and procedures to make field measurements of water content in 1-cm thick soil layers are described. When the detector probe temperature varied 23C and gravimetric water content ranged from 0.021 to 0.186 grams per gram over a measurement period, the average deviation of measured versus calculated values of water content was 0.009 grams per gram. (Knapp-USGS)
W71-12376

EFFECT OF WATERLOGGING AND ORGANIC MATTER ON THE LOSS OF APPLIED SULFUR,
California Univ., Hopland. Hopland Field Station.
M. B. Jones, W. A. Williams, and W. E. Martin.
Soil Science Society of America Proceedings, Vol 35, No 4, p 542-546, July-August 1971. 5 tab, 13 ref.

Descriptors: *Saturated soils, *Sulfur, *Gypsum, *Leaching, *Anaerobic conditions, Nutrients, Grasslands, Sulfates, Reduction (Chemical), Soil chemistry, Soil-water-plant relationships, Organic matter, Oxidation-reduction potential, Lysimeters, Sulfur bacteria, California.
Identifiers: Sulfur uptake.

Gypsum and elemental sulfur were applied to lysimeters before the first fall rains. Water logging and barley straw mulch were also used in all possible combinations. Nitrogen was applied uniformly to all tanks, and cereal and grass were grown during two seasons. In the first year after application of gypsum, 45 and 41 kg/ha of sulfur were recovered in the leachate from freely drained soil with and

without straw, respectively. The free draining tanks treated with elemental sulfur yielded 10 and 7 kg/ha. Waterlogging decreased leaching loss of sulfur by an average of 40%. Oats planted when waterlogging was discontinued took up more sulfur in the absence of straw, and more sulfur was leached than with free drainage. However, no significant increase in uptake occurred in the succeeding grass crop as a result of the sulfur conserved by the waterlogging. (Knapp-USGS)
W71-12377

A STATISTICAL COMPARISON OF pH VALUES OF SOME ENGLISH SOILS AFTER MEASUREMENT IN BOTH WATER AND 0.01M CALCIUM CHLORIDE,
Cincinnati Univ., Ohio. Dept. of Geography.
B. E. Davies.
Soil Science Society of America Proceedings, Vol 35, No 4, p 551-552, July-August 1971. 4 tab, 6 ref.

Descriptors: *Soil chemistry, *Hydrogen ion concentration, Statistical methods, Correlation analysis, Soil tests, Electrolytes.

Published pH values of British soils, determined both by equilibration with water and 0.01M CaCl2 solution were analyzed by statistical techniques. Values from the two determinations are linearly related with a highly significant positive correlation. A pH of 6.5 is conviently regarded as neutrality when soil reaction is determined with CaCl2 solution. (Knapp-USGS)
W71-12378

DEMISING OF EXCHANGEABLE CATIONS IN FREE-SWELLING BENTONITE CLAY,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
D. H. Fink, F. S. Nakayama, and B. L. McNeal.
Soil Science Society of America Proceedings, Vol 35, No 4, p 552-555, July-August 1971. 3 fig, 13 ref.

Descriptors: *Expansive clays, *Montmorillonite, *Absorption, *Ion exchange, Sodium, Calcium, Mineralogy, Cation adsorption, Crystallography, Water chemistry.

Hypothetical models for the crystalline, interlayer swelling of mixed-ion (Na and Ca) montmorillonites were developed for two types of cationic distributions on the clay minerals; namely, for complete demixing and for complete random mixing of cations. The model for demixing was expanded to include both the alternate layering of Ca- and Na-saturated platelets and the complete demixing of cations into separate Na- and Ca-domains. The models are based on the principles of limited interlayer swelling for Ca-montmorillonite, and free swelling for Na-montmorillonite as the water content of the system is increased beyond approximately 120%. Low-angle X-ray diffraction showed that the relative distribution of Na and Ca ions of the clay exchange complex was a function of the exchangeable sodium percentage (ESP). The two cations were randomly mixed for ESP values greater than approximately 50%. They were partially demixed for ESP values between approximately 50 and 15%. For ESP values less than approximately 10 to 15%, no cation demixing in interlayer regions was evident, but the interlayer exchange complex was predominantly Ca-saturated and the exchange complex on external surfaces was predominantly Na-saturated. Although experimental techniques could show that demixing occurred within certain ranges of ESP values, it was not sensitive enough to differentiate between demixing by domains and demixing by alternate layers. (Knapp-USGS)
W71-12379

PESTICIDE ADSORPTION MEASUREMENT BY FLOW EQUILIBRATION AND SUBSEQUENT DISPLACEMENT,
du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Lab.
For primary bibliographic entry see Field 05A.
W71-12380

DIFFERENTIAL Sr-Ca BONDING ON SOIL AS INFLUENCED BY BONDING SITE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
S. M. Elgawhary, and S. A. Barber.
Soil Science Society of America Proceedings, Vol 35, No 4, p 566-571, July-August 1971. 6 fig, 2 tab, 8 ref.

Descriptors: *Soil chemistry, *Ion exchange, *Organic matter, Chromatography, Calcium, Potassium, Adsorption, Cation adsorption, Equilibrium.
Identifiers: Strontium.

The Sr-Ca selectivity coefficient, k, was used to interpret the differential Sr-Ca bonding of cation exchange sites in two soils. A dominant complementary cation, k, was used to place the Sr and Ca on sites favored Sr and Ca over k. As the equivalent fraction of Sr plus Ca in the equilibrium solution was reduced, k decreased, indicating that organic exchange sites were the first to be filled. When the complementary ion was Mg or Ba, k was much larger, indicating that these complementary ions completed more nearly equally with Sr and Ca for all exchange sites. The relationship between the log of the equivalent fraction of Sr plus Ca and k was linear over segments of the range of equivalent fraction used. Little Sr and Ca separation occurred with the Edwards muck apparently because of the over-shadowing of the readily exchangeable cations by Sr and Ca adsorbed in very slow exchangeable positions resulting in little movement of these ions. (Knapp-USGS)
W71-12381

REACTION OF COPPER TETRAMMINE WITH BENTONITE CLAY,
California Univ., Berkeley. Space Sciences Lab.
M. H. El-Sayed, R. G. Burau, and K. L. Babcock.
Soil Science Society of America Proceedings, Vol 35, No 4, p 571-574, July-August 1971. 3 fig, 3 tab, 11 ref. USAEC Contract AT (11-1)-34.

Descriptors: *Ion exchange, *Clay minerals, *Copper compounds, Copper, Cation adsorption, Soil chemistry, Nutrients.
Identifiers: Ammines.

Copper (II) tetramine was accumulated by bentonite in amounts greatly exceeding its cation exchange capacity. Analyses of aorption isotherms disclosed that at least two distinct reactions were involved. The first was completed at low equilibrium concentration and appeared to be insensitive to temperature changes. The second was an endothermic process that simulated compound formation. Exchangeable copper tetrammine on the clay was evaluated by isotopic dilution and its exchange reaction with calcium was investigated. It is doubtful that copper tetrammine can be used directly to assess copper exchange capacity of clays. (Knapp-USGS)
W71-12382

CHEMICAL CHARACTERISTICS OF THE COPPICE DUNE SOILS IN PARADISE VALLEY, NEVADA,
Agricultural Research Service, Reno, Nev. Soil and Water Conservation Div.
D. M. Stuart, G. E. Schuman, and A. S. Dylla.
Soil Science Society of America Proceedings, Vol 35, No 4, p 607-611, July-August 1971. 5 fig, 2 ref.

Descriptors: *Saline soils, *Nevada, *Land reclamation, *Alkaline soils, Chlorides, Sodium, Boron, Salinity, Sulfates, Hydrogen ion concentration, Silica, Ion exchange, Toxicity, Leaching, Dunes, Rabbitbush.
Identifiers: Paradise Valley (Nev).

The coppice dune and associated barren playa soils of Paradise Valley, Nevada contain large amounts of soluble salts, exchangeable sodium, and boron. The concentrations of salts and sodium are variable. Sodium and Cl appear to be the principal soluble ions. The pH at the surface is high (usually over 9). Exchangeable sodium percentage is high at the surface (over 30%) and decreases with depth. Boron, while highly variable, is high enough at several locations to limit the growth of even tolerant species. Silica in the saturated extracts increases as the soil pH increases. Because of the salts, high pH, exchangeable sodium, and toxic concentrations of boron, even partial reclamation of these soils would prove difficult without adequate supply of water, large amounts of amendments, and considerable expense. (Knapp-USGS)
W71-12383

PEDOTURBATION BY ARTESIAN ACTION,
North Dakota State Univ., Fargo. Dept. of Soils.
G. A. Johnsgard.
Soil Science Society of America Proceedings, Vol 35, No 4, p 612-616, July-August 1971. 5 fig, 12 ref.

Descriptors: *Groundwater movement, *Soil water movement, *Soil structure, *Sedimentary structures, *Soil horizons, Soil profiles, Azonal, Freezing, Thawing, Frozen soils, Frost heaving.
Identifiers: *Pedoturbation.

Water under artesian pressure below a frozen soil zone may be a cause of soil mixing as the frozen layer thaws in the spring. Thawing occurs at both the top and the bottom of the frozen soil zone. Points or areas of weakness in the frozen soil zone develop and become sites at which subsurface water breaks through the frozen zone. Artesian pressure, below the frozen zone, causes water and soil materials to move upward. It is proposed that among the consequences is the mixing of the soil in and above the frozen zone. (Knapp-USGS)
W71-12384

COMPOSITION AND WEATHERING OF LOESS MANTLED WISCONSIN-AND ILLINOIAN-AGE TERRACES IN CENTRAL OHIO,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 02J.
W71-12385

METHODS OF SUSTAINING GOOD INFILTRATION RESULTS,
North Holland. Provincial Waterworks (Netherlands).
For primary bibliographic entry see Field 04B.
W71-12409

CLAY MINERALOGY OF SOILS DEVELOPED FROM QUARTERNARY DEPOSITS OF THE EASTERN SIERRA NEVADA, CALIFORNIA,
Colorado Univ., Boulder. Dept. of Geological Sciences.
P. W. Birkeland, and R. J. Janda.
Geological Society of America Bulletin, Vol 82, No 9, p 2495-2513, September 1971. 5 fig, 3 tab, 69 ref.

Descriptors: *Clay minerals, *Weathering, *California, *Soil formation, Glacial drift, Mineralogy, Climates, Sampling, Stratigraphy, Vegetation effects, Soil classifications, Montmorillonite, Kaolinite, Illite.
Identifiers: Sierra Nevada (Cal).

The types and abundances of clay minerals in soils formed on glacial and glaciofluvial deposits of the eastern Sierra Nevada were studied in relation to age and lithology of the soil parent material, and to variations in present climate and vegetation. The most abundant soil clay minerals are illite and halloysite. Soil clay mineral assemblages do not vary with age of soil parent material (glacial drift); thus, time or paleoclimatic variations, or both, are not the main controlling factors of clay formation. Factors of soil and clay formation, including climate, may have been relatively constant during middle and late Quaternary weathering. It is concluded

that factors other than age are more important in determining soil clay mineral assemblages. The abundance of kaolin minerals relative to that of illite appears to be primarily related to climate and vegetation; the persistence of kaolin minerals at the southern end of the traverse, however, may result from lithologic controls as well as climate and vegetation. The presence or absence of montmorillonite apparently also reflects a combination of lithology, climate, and vegetation. (Knapp-USGS)
W71-12455

EFFECT OF DENSITY OF BROWN MEADOW IRRIGATED SOIL ON SEED GERMINATION, GROWTH AND YIELD OF MAIZE, (IN RUSSIAN),
For primary bibliographic entry see Field 03F.
W71-12490

ENVIRONMENTAL FLUCTUATIONS ON SOUTH-FACING SLOPES IN THE SANTA CATALINA MOUNTAINS OF ARIZONA,
Arizona Univ., Tucson. Office of Arid Land Studies.
For primary bibliographic entry see Field 02D.
W71-12497

EFFECT OF SOIL MOISTURE ON THE WATER SYSTEM OF PEACH,
L. M. Tolstaya-Man' Kovskaya.
Izv Akad Nauk Mold Ssr Ser Biol Khim Nauk. 2. 88-90. Illus. 1970.
Identifiers: Intake, Irrigation, Leaf, Moisture, Peach-D, Root, Soil, System, Water.

Changes in the physiological indices of peach in relation to changes in soil moisture were studied under field conditions to determine the irrigation periods of peach. An inverse relationship existed between the intake capacity of leaves and soil moisture. There was a direct relationship between leaf hydration and soil moisture. The water-retaining capacity of the roots was less than that of the leaves. Water content was greater in the leaves than the roots.--Copyright 1971, Biological Abstracts, Inc.
W71-12535

SPECIFIC GRAVITY, POTATO CHIP COLOR AND TUBER MINERAL CONTENT AS AFFECTED BY SOIL MOISTURE AND HARVEST DATES,
Kansas Agricultural Experiment Station Manhattan. Dept. of Horticultural Forestry.
For primary bibliographic entry see Field 03F.
W71-12537

SOIL PHYSICAL INVESTIGATIONS IN GREENHOUSE CROPS IN SCANIA 1965-1968, (M SWEDISH),
Institutionen for Koksvaxt- och Prydnadsvaxtodling, Alnarp (Sweden).
Lennart Ottosson.
Lantbrukshogsk Medd Ser A. 125. 3-42. Illus. 1969 (Engl summ).
Identifiers: Crops, Cucumber-D, Greenhouse, Growing, Humus, Peat, Physical, Pore, Scania, Season, Size, Soil, Solid, Straw, Sweden, Water.

In cucumber beds the volume of solids varied between 17 and 40% in the upper levels. Peat beds had a very low volume of solids. When the volume of solids increased at lower levels in the beds, the pore size became smaller, indicating more water retained. The humus content had the greatest correlation with the physical condition of the soil; it was also the factor most easily influenced by the addition of organic material. The majority of beds had a satisfactory physical condition. During the progressive reduction of humus content during the growing season, the solids volume increased; a change in the pore size distribution was noted. Plot trials with the addition of straw and peat, applied separately and together, showed that these materials are fairly similar in value. Peat influenced mainly the humus content and the porosity, while straw had a good effect upon the pore size distribution. The coarseness of the peat and its degree of humification influenced volume of solids and pore size distribution of the peat. Beds composed of finely divided peat had small pores, which retain water and are more easily overwatered.--Copyright 1971, Biological Abstracts, Inc.
W71-12538

EFFECTS OF IRRIGATION WATER TEMPERATURE ON SOIL TEMPERATURE,
New Mexico State Univ; University Park. Dept. of Agronomy.
P. J. Weirenga, Robert M. Hagan, and E. J. Gregory.
Agron J. 63 (1): 33-36. 1971.
Identifiers: Conduction, Cooling, Evaporative, Heat, Irrigation, Probe, Soil, Temperature, Thermocouple, Water.

Soil temperatures were measured in fields irrigated with normal and cold water and in unirrigated soil. Temperatures were measured with probes made of thermocouple wire enclosed in 3 mm O.D. stainless-steel tubing. Errors in temperature measurement were on the order of 0.1C or less. The effects of irrigation water temperature on soil temperature were small and of short duration. Differences in soil temperature resulting from irrigation with water of 27 and 14C lasted for less than 24 hr at 5 and 10 cm, and for 60 hr at 30 cm. Irrigated soil temperatures were significantly reduced by evaporative cooling from the soil surface after irrigation in mid-April, though not in mid-Feb.--Copyright 1971, Biological Abstracts, Inc.
W71-12574

APPLICATION OF AN EXTRACTION-TERM MODEL TO THE STUDY OF MOISTURE FLOW TO PLANT ROOTS,
Auburn Univ., Ala. Dept. of Civil Engineering.
F. J. Molz, and Irwin Remson.
Agron J. 63 (1): 72-77. 1971.
Identifiers: Depth, Extraction, Flow, Model, Moisture, Plant, Root, Roots, Term, Transpiration.

A one-dimensional extraction-term model is used to simulate the moisture flow and removal process in the vicinity of plant roots. The dependence of model results on root depth and soil type are investigated. Moisture contents, root moisture absorption rates and soil-moisture fluxes are computed and discussed for several hypothetical root systems in a sandy soil and in a clay soil. The model is solved numerically with a procedure based on the Douglas-Jones predictor-corrector method. Moisture extraction by the roots from soil in their immediate vicinity is the dominant process, with Darcian flow in the root zone playing a smaller but often significant role. Extraction-term models are versatile and seem able to describe many of the phenomena associated with moisture removal by the roots of transpiring plants.--Copyright 1971, Biological Abstracts, Inc.
W71-12577

MISCIBLE DISPLACEMENT MEASUREMENTS WITHIN LABORATORY COLUMNS USING THE GAMMA-PHOTONEUTRON METHOD,
du Pont de Nemours and Co., Aiken, S.C., Savannah River Lab.
J. C. Corey, R. H. Hawkins, R. F. Overman, and R. E. Green.
Soil Sci Soc Amer Proc. 34 (6): 854-858. Illus. 1970.
Identifiers: Columns, Displacement, Flow, Gamma, Heavy, Laboratory, Mathematical, Measurements, Method, Methos, Miscible, Model, Neutron, Nuclear, Photo, Stable, Water.

When fluid in a porous medium is displaced by a 2nd fluid that is miscible with the 1st, a transition zone exists between the 2. The length and location of this transition zone is a soil column is difficult to measure in situ. When one of the fluids contains D2O as the major component, a new procedure, the gamma-photoneutron method, readily measures this transition zone. This method permits precise measurements of the average concentration of heavy water (D2O) at selected locations in a soil column. The utility of the method is illustrated by 2 experiments: the downward displacement of D2O (specific gravity of 1.105 g/cm3) by H2O, and the downward displacement of H2O by D2O .. NaNO3 (specific gravity of 1.291 g/cm3). The mathematical model which describes the shape of the transition zone between the miscible fluids requires the apparent diffusion coefficients to be constant. The apparent diffusion coefficient was not constant as the zone moved through a 100-cm column. Unstable flow due to viscosity differences between fluids was probably responsible for increases in the apparent diffusion coefficient when H2O displaced D2O.--Copyright 1971, Biological Abstracts, Inc.
W71-12578

SOME PRELIMINARY STUDIES ON THE POKKALI SALINE SOILS OF KERALA,
Agricultural Coll., Vellayani (India).
Thomas Varghese, P. S. Thampi, and N. S. Money.
J Indian Soc Soil Sci. 18 (1): 55-69. 1970.
Identifiers: Acidity, Conductivity, Electrical, High, India, Kerala, Pokkali, Saline, Soils, Studies.

These soils are acidic throughout the year in spite of their high electrical conductivity caused by the intrusion of salt water from the adjoining lakes during certain months. They are highly deficient in P and Ca, fairly high in K and Mg and hence require the application of phosphatic fertilizers in conjunction with lime to correct excess acidity and counteract the effect of excess amounts of Mg. The contents of total soluble salts, chlorides and sulfates varied with weather conditions. The infertility of the Pokkali soils is due mainly to high acidity, rather than salinity.--Copyright 1971, Biological Abstracts, Inc.
W71-12579

INFLUENCE OF STRUCTURE ON THE WATER RETENTION BY SOIL SAMPLES,
Indian Agricultural Research Inst., New Delhi. Div. of Agricultural Physics.
Y. Nagarajarao.
Z Pflanzenernaehr Bodenk. 127 (2): 134-143. Illus. 1970.
Identifiers: Destruction, Retention, Samples, Soil, Structure, Water.

Water retention at pF (water holding index) values 3.3 and 4.2 was studied on samples with natural and disturbed structure from 10 Pelosol-profiles. In general, in the A-horizons or top soils with hg her aggregate stability (and well expressed structure) and relatively low swelling, destruction of structure reduced the amount of water retained (particularly sieved samples), whereas subsurface soil samples retained more water (particularly puddled samples). This is due to the difference in the effect of structure destruction. Water retention in the complete range of pF-values should be carried out on soil samples with natural structure.--Copyright 1971, Biological Abstracts, Inc.
W71-12580

LAND USE EFFECTS ON THE HYDROLOGIC CHARACTERISTICS OF SOME HAWAII SOILS,
Forest Service, Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
Hulton B. Wood.
Journal of Soil and Water Conservation, Vol 16, No 4, p 158-160, July-August 1971. 3 fig, 2 tab, 12 ref.

Descriptors: *Soil physical properties, *Hawaii, *Soil water, *Land use, *Infiltration, Soil aggregates, Soil structure, Porosity, Hydraulic conductivity, Land management, Crop production, Grazing.
Identifiers: Oahu (Hawaii).

Hydrologic characteristics of soil on Oahi differ according to land uses. This conclusion was based on infiltration rates and bulk and undisturbed core soil samples collected from adjacent sites on the same soil series but having different land uses. Aggregates of surface soils were much larger on forest and pasture land than on sugarcane or pineapple land. Except for one site, infiltration rates were considerably higher in forest soils than in non-forest soils. Total porosity and large pore space were also greater in the forest soils. (Knapp-USGS)
W71-12599

CRITICAL SALT REGIME OF IRRIGATED SOILS AND GROUNDWATER DRAINAGE IN THE COTTON GROWING ZONE (Kriticheskiy solevoy rezhim oroshayemykh pochv i drenazh gruntovykh vod v zone vozdelyvaniya khlopka),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 03C.
W71-12606

METHODS FOR STUDYING FROZEN PEAT AND MINERAL SOILS OF THE KARELIAN ASSR (Metody issledovaniy promerzayushchikh torfyanykh i mineral'nykh pochvogruntov Karel'skoy ASSR),
Akademiya Nauk SSSR, Petrozavodsk. Karelskii Filial.
For primary bibliographic entry see Field 02C.
W71-12610

MEASUREMENT AND INTERPRETATION OF PHYSICAL PROPERTIES OF SOILS,
Oregon State Univ., Corvallis. Dept. of Soils.
Narender Kumar Nagpal.
Ph D Thesis, Oregon State University, June 1971. 159 p, 71 fig, 21 tab, 58 ref, append. OWRR Project B-001-ORE (9).

Descriptors: *Soil physical properties, *Porosity, *Instrumentation, Heat transfer, Mass transfer, Soil water movement, Heat flow, Soil moisture, Permeability, Soil properties, Porous media.
Identifiers: Porosimeters.

Use of the mercury intrusion porosimeter in determining pore size distributions of soils was evaluated. Eight soils differing in clay content were tested. The porosimeter and soil water characteristic curves gave identical results. Adoption of mercury intrusion as a standard laboratory procedure is suggested. Thermal conductivities of three size classes of glass beads, 53-74 microns, 74-105 microns, and 149-210 microns, were predicted using the model developed by de Vries. Predicted and experimental values of thermal conductivity showed good agreement. Pore size distribution had no influence on thermal conductivity. Pore size distribution does affect the rate of water loss from porous beds subjected to diurnal temperature fluctuations. Smaller pores resist rapid loss of water vapor and as a result total heat exchanged in beds made up of small particles was much smaller than that observed for beds made up of large particles. The evaporative flux constitutes a major part of the total heat flux. Incoming radiation was observed to be used more efficiently in moist samples than in dry samples. (Knapp-USGS)
W71-12686

OXYGEN STATUS OF SOIL AIR AND SOIL WATER AS INFLUENCED BY OXYGEN TRANSFER THROUGH THE SOIL PROFILE,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. W. Wengal.
Available from the National Technical Information Service as PB-202 874, $3.00 in paper copy, $0.95 in microfiche. Completion Report, June 1971. 5 p. OWRR Project A-018-CONN (2).

Descriptors: *Soil oxygen, *Diffusivity, Diffusion, Porosity, Lysimeters, Soil moisture, Soil chemistry, *Oxygenation, Aeration.
Identifiers: Soil oxygen, *Soil aeration, Soil lysimeters, Oxygen transfer.

Studies of soil oxygen diffusion into and through the soil profile were conducted to determine the oxygen status of soil under varying soil moisture conditions. It was found that soil oxygen diffusivity was related to soil air-space porosity even at high soil moisture levels such that the relationship could be described by a single function. In this manner different soil layers within the profile were found to have distinct diffusivity-porosity relationships. Significantly, soil oxygen diffusivities were found to be an order of magnitude lower than published values for disturbed soil samples showing that it is necessary to determine diffusivity on undisturbed soil core samples if field conditions of soil oxygen transfer systems are to be studied. Field lysimeter studies indicated that oxygen consumption at different soil depths could be calculated from diffusivity measurements and field measurements of soil moisture, bulk density, temperature, and oxygen concentrations. Too, in a similar manner, maximum activity (oxygen consumption) could be predicted for a given soil and soil depth thus enabling classification of soils as to their oxygen supplying potential.
W71-12699

TRANSIENT FLOW OF WATER FROM INFILTROMETERS--FORMULATION OF MATHEMATICAL MODEL AND PRELIMINARY NUMERICAL SOLUTIONS AND ANALYSES OF RESULTS,
Utah State Univ., Logan. Utah Water Research Lab.
Roland W. Jeppson.
Utah Water Research Laboratory, PRWG - 59 c-2, June 1970. 50 p, 25 fig, 6 tab, 41 ref, 72 equations.

Descriptors: *Unsteady flow, *Numerical analysis, *Infiltrometers, *Mathematical models, *Model studies, Analysis, Soil moisture, Approximation method, Soil water movement, Computer models, Moisture tension, Limiting factors, Unsaturated flow, Computer programs, Theoretical analysis, Flow characteristics, Soil types, Wetting.
Identifiers: *Differential equations.

This is a progress report which develops numerical solution capabilities to transient flow resulting from surface applied moisture. The alternating direction, implicit finite difference method is used to solve partial differential equations using initial boundary values which describe 3-dimensional, axisymmetric water flow from an infiltrometer through partially saturated soil. These results will be useful in improving solution techniques and computer programs for experimental verification of theoretical models. Flow characteristics from 34 solutions and 12 soil types for varying initial conditions are summarized in 25 figures and 6 tables. Relationships between depth of penetration, lateral movement of wetting front, application rate and initial hydraulic head (soil tension) are developed. Fortran programs and flow charts are described. (Popkin-Arizona)
W71-12741

CHEMICAL PROPERTIES OF THE ARID SOIL ORGANIC FRACTION,
Battelle Memorial Inst. Richland, Wash. Pacific Northwest Labs.
Raymond E. Wildung, Benjamin F. Hajek, and Keith R. Price.
Northwest Science, Vol 45, No 2, p 73-79, May, 1971. 2 tab, 19 ref. U.S. AEC Contract AT (45-1)-1830.

Descriptors: *Arid lands, *Organic matter, *Humic acids, *Soil chemical properties, Humus, Carbon, Nitrogen, Sagebrush, Grasses, Soil moisture, Vegetation effects, Altitude, Ecosystems, Nutrients, Ion exchange, Biomass, Environmental effects, Clay, Carbon, Colloids, Chemical composition, Hydrogen ion concentration.

Information regarding the mechanics and extent of participation of the soil organic fraction and soil microflora in soil transformation phenomena is particularly incomplete for arid zone soils. Soil samples were collected along a 15 km altitudinal transect from 155-1060 m elevation, in an arid sagebrush region in SE Washington. Samples were analyzed for pH, Organic C, sand, silt, clay and cation (Sr) exchange capacity (CED). Soil humic acids, amorphous, high molecular weight and high-charge density organic colloids were isolated and compared with respect to elemental composition and pH-dependent CEC. C. and clay contents ranged from 0.43 - 3.6% and 6.4 - 16.3%, respectively. The increase of organic C with elevation reflects increased plant biomass with increased rainfall, increased grass lignin content and decreased soil organic matter degradation with decreased mean ambient temperature. Soil CEC increased with increasing C and clay as a result of increased surface area and solid phase coulombic charge. Soil humic colloid yields ranged from 4.6 - 16.6%. Their CECs were highly pH-dependent, ranging from 76-196meq/100g at pH 4.0 to 190-270 meq/100g at pH 7.0. Techniques for isolation and characterization of soil humic colloids, developed in humid and subhumid regions, generally worked well when applied to the arid soils. Chemical properties of arid soil humic acids were uniform regardless of altitude or vegetation and their chemical composition and CEC were similar to analagous isolates from humid regions. (Casey-Arizona)
W71-12750

WATERMOVEMENT IN LARGE SOIL PORES: A CHANNEL SYSTEM CONCEPT OF INFILTRATION,
Agricultural Research Service; Reno, Nev; and Wisconsin Univ; Madison.
R. M. Dixon, and A. E. Peterson.
Wisconsin University, Research Report 74, June 1971. 7 p, 4 fig, 1 tab, 9 ref.

Descriptors: *Infiltration, *Soil water movement, *Air-earth interfaces, *Porous media, Hydrologic properties, Soil surfaces, Pores, Transmissivity, Soil Management, Watershed management, Cultivation, Mulching.
Identifiers: *Infiltration concept, *Infiltration control, *Cultural practice design, bimodal porous media, Macropores, Surface geometry, Surface cover, Soil air pressure, Soil air movement.

A new physical interpretation of the infiltration process, termed the channel system concept, is presented. In this concept soils are viewed as bimodal porous media. The soil surface plus macropores are referred to collectively as the channel system, whereas the micropore region in which macropores are imbedded is called the capillary system. The channel system serves as a source of free water for the sink of the capillary system. According to this concept, the efficiency of the channel system as a water source depends on its surface geometry. Channel systems having rough surfaces with open macropores are highly efficient in spatially distributing free water and exhausting displaced soil air, but those having smooth surfaces and closed macropores are essentially nonfunctional. Six channel system states were established to represent the total range of soil surface conditions commonly found in cultivated and uncultivated soils. These states control both rate and route of water penetration into soils. Infiltration often differs by more than an order of magnitude between the two extreme states. This concept appears applicable to numerous soil and watershed management problems wherein uncontrolled infiltration is a contributing factor. (Dixon-ARS)
W71-12753

WATER MOVEMENT IN LARGE SOIL PORES: VALIDITY AND UTILITY OF THE CHANNEL SYSTEM CONCEPT,
Wisconsin Univ, Madison; and Agricultural Research Service, Renv. Nev.
A. E. Peterson, and R. M. Dixon.

University of Wisconsin Research Report 75, June 1971. 7 p, 7 fig, 2 tab, 16 ref.

Descriptors: *Infiltration, *Soil water movement, *Soil management, *Watershed management, Soil surfaces, Cultivation, Mulching.
Identifiers: *Infiltration control, *Cultural practice design, Surface geometry, Surface cover.

The channel system concept of infiltration is based on the theses that large soil pores and soil air pressure are commonly encountered in the field; that they have a profound influence on rate of infiltration and route of water penetration; and that this influence is controlled by soil surface conditions or the channel system state. The concept is consistent with basic flow principles and with innumerable field infiltration and morphological observations reported in the literature. Experimental data are presented as further supporting evidence. The channel system concept appears applicable to a wide range of problems related to rate and route of water penetration such as (a) runoff, erosion, and surface water pollution; (b) salt leaching and ground water pollution; (c) lateral distribution of soil water; and (d) aeration, drainage and evaporation. (Dixon - ARS)
W71-12754

SWELLING CLAY IN TWO SLOPE FAILURES AT TORONTO, CANADA,
University of Western Ontario, London. Dept. of Engineering Science.
R. M. Quigley, M. A. J. Matich, R. G. Horvath, and H. H. Hawson.
Canadian Geotechnical Journal, Vol 8, No 3, p 417-424, August 1971. 7 fig, 13 ref.

Descriptors: *Expansive clays, *Slope stability, Clay minerals, Mineralogy, Landslides, Montmorillonite, Leaching, Ion exchange, Soil chemistry, Weathering, Glacial drift, Till.
Identifiers: Glacio-lacustrine soils, Toronto (Ont).

Swelling clay minerals present in stiff to hard glacio-lacustrine soils along part of the Don Valley Parkway, Toronto, are believed to have caused accelerated soil softening and subsequent failure of several slopes only 4 to 8 years after construction. Residual friction angles of 16 deg give some indication of the presence of these swelling minerals, whereas activity values of 0.4 to 0.5 give no indication of their presence. Mineralogic analyses show the soils to consist of abundant illite, chlorite, and carbonate, and moderate amounts of quartz, feldspar, and swelling clay. The swelling clays (10-15% of soils) are an unusual pseudo-montmorillonite formed from soil-vermiculite by adsorption of complex aluminum and iron hydroxide cations in an ancient, acid, weathering environment. Because the clay beds have not themselves been weathered, they must be erosion products from earlier geologic formations in the Toronto area. (Knapp-USGS)
W71-12804

EFFECTS OF SALT CONCENTRATION AND CATION SPECIES ON THE MEASURED CATION-EXCHANGE CAPACITY OF SOILS AND CLAYS,
Kyushu Univ., Fukuoka (Japan). Faculty of Agriculture.
K. Wada, and Y. Harada.
Proceedings of the International Clay Conference, September 5-10, 1969, Tokyo, Japan, Volume 1; Israel Universities Press, Jerusalem, p 561-571, 1969.

Descriptors: *Soil water, *Soils, *Clays, *Cation exchange, *Salinity, Soil chemical properties, Leaching, Chemical reactions, Ion exchange, Salt balance, Hydrolysis, Aluminum.
Identifiers: *Cation-exchange capacity (Soils).

Effects of salt concentration and cation species on the cation-exchange capacity were studied with soils and clays of different mineral composition. The C.E.C. was measured by a method that eliminates washing for removal of excess saturating salt. The effect of equilibrium salt concentration on the C.E.C. appears most markedly for allophane and 'imogolite' with a silica/aluminum oxide ratio of about 1.0, next for allophane with a silica/aluminum oxide ratio of about 2.0 and halloysite, and least for montmorillonite. For any particular mineral and exchangeable cation, the procedure adopted gave a 'true' C.E.C. on equilibration with 0.05 N salt solution, avoiding errors due to hydrolysis and salt retention. The allophane and 'imogolite', however, showed an unexplained cation species effect, and the ratio of the lowest to the highest C.E.C. approached 0.5 to 0.6. (Woodard-USGS)
W71-12821

DETERMINATION OF CATION-EXCHANGE CAPACITY WITH THE POTASSIUM SPECIFIC-ION ELECTRODE,
Geological Survey, Denver, Colo.
R. L. Malcolm, V. C. Kennedy, and E. A. Jenne.
Proceedings of the International Clay Conference, September 5-10, 1969, Tokyo, Japan, Volume 1; Israel Universities Press, Jerusalem, p 573-583, 1969.

Descriptors: *Soil water, *Clays, *Cation exchange, *Electrodialysis, *Potassium, Analytical techniques, Soil chemical properties, Ion exchange, Leaching, Hydrolysis.
Identifiers: *Cation-exchange capacity (Soils).

The K released during Ba-K exchange on several types of earth material was measured with a cationic electrode. After exchange, the steady-state concentration of K was a measure of the C.E.C. (cation-exchange capacity) of the sample. With carbonate-free material, the method was comparable in accuracy and precision with the Sr-85 method of measuring C.E.C. The potassium electrode method has a distinct advantage over Sr and Ca methods of measuring C.E.C., because it is free from Ca or Sr carbonate interference. The Cs-137 method was undesirable for routinely determining C.E.C., because the values are low if vermiculite is present in the sample. Sr and Ca carbonates are common in arid soils and vermiculite is common in soils throughout the United States. The C.E.C. of samples as small as 5 mg can be determined. The rate of cation exchange and the presence of vermiculite may also be determined in the same experiment. Other advantages of this technique over established methods include the assurance of full exchange capacity measurement, the elimination of sample losses as a result of dispersion or leaching, and the ease of sample recovery. (Woodard-USGS)
W71-12822

A THERMODYNAMIC STUDY OF SODIUM-STRONTIUM EXCHANGE ON WYOMING BENTONITE,
Soils Lab., Beltsville, Md. Soil and Water Conservation Research Div.
R. Van Bladel, and R. Menzel.
Proceedings of the International Clay Conference, September 5-10, 1969, Tokyo, Japan, Volume 1; Israel Universities Press, Jerusalem, p 619-634, 1969. 6 fig, 4 tab, 15 ref.

Descriptors: *Soil moisture, *Cation exchange, *Bentonite, *Clays, *Thermodynamics, Soil chemical properties, Leaching, Chemical reactions, Ion exchange, Sodium, Analytical techniques.
Identifiers: *Ion exchange (Sodium-strontium).

Ion exchange equilibria for the pair sodium-strontium between chloride solutions and a montmorillonite clay were studied at two temperatures (5 deg and 25 deg C) and three total normalities of the equilibrium solution (5, 10 and 25 meq./liter). The cation exchange capacity of the homoionic Na-clay increased with increasing normality, whereas that for Sr-clay did not change appreciably. The standard free energy change for converting Na-clay to Sr-clay was determined to be-97 and -123 cal/equiv. at 5 deg and 25 deg C, respectively, by calculating the true thermodynamic equilibrium constant. The standard enthalpy change was measured calorimetrically (318 cal/equiv.) and calculated from the temperature coefficient of the equilibrium constant (271 cal/equiv.). The thermodynamic approach was justified by the validity of the analog of Henry's law in the trace strontium of sodium regions. Calculation of surface phase activity coefficients and excess enthalpy and entropy showed that the energy of adsorption of the cations depends on surface composition and that the increased selectivity for strontium ion with Sr content on the clay is due in large part to energy effects rather than entropy effects. (Woodard-USGS)
W71-12824

THERMODYNAMICS OF INTERLAYER ADSORPTION OF WATER IN CLAYS, 2. MAGNESIUM VERMICULITE,
Shell Development Co., Houston, Tex. Exploration and Production Research Div.
H. Van Olphen.
Proceedings of the International Clay Conference, September 5-10, 1969, Tokyo, Japan, Volume 1; Israel Universities Press, Jerusalem, p 649-657, 1969. 2 fig, 1 tab, 4 ref.

Descriptors: *Thermodynamics, *Adsorption, *Water vapor, *Clays, *Soil moisture, Magnesium, X-ray diffraction, Isotherms, Analytical techniques.
Identifiers: *Magnesium vermiculite.

Adsorption and desorption isotherms for water vapor on magnesium vermiculite (from Llano, Texas) were determined at 25 deg C and at 50 deg C. The c-spacing was measured at various points along the isotherms. The two-step isotherms and the X-ray patterns indicate the successive formation of a one-layer and a two-layer hydration complex. In the two-layer hydration range, an initial, loosely packed hydrate and a final, more densely packed hydrate can be distinguished. The water contents in the three stages correspond to water molecule-magnesium ion ratios of 3.5, 10, and 11. Heats of adsorption were determined directly by calorimetric measurements of the heats of immersion of the clay at various initial surface coverages. As was found for sodium vermiculite, the heat of adsorption per mole of water for the first water layer is about twice that for the second water layer. For both layers, the heats of adsorption per mole of water are about twice those measured for the sodium clay. (Woodard-USGS)
W71-12825

X-RAY DIFFRACTION AND ADSORPTION ISOTHERM STUDIES OF THE MONTMORILLONITE-WATER SYSTEM,
Wisconsin Univ., Milwaukee.
G. L. Roderick, D. Senich, and T. Demirel.
Proceedings of the International Clay Conference, September 5-10, 1969, Tokyo, Japan, Volume 1; Israel Universities Press, Jerusalem, p 659-668, 1969. 4 fig, 12 ref.

Descriptors: *X-ray diffraction, *Water vapor, *Adsorption, *Isotherms, *Montmorillonite, Clays, Soil moisture, Sodium, Calcium, Sorption, Pressure, Hydrologic data, Analytical techniques.

X-ray diffraction data during adsorption of water vapor on Na- and Ca-montmorillonites show that interlayer expansion is continuous but nonuniform. X-ray and adsorption isotherm data indicate that an ice-like configuration of water molecules is completed with the fourth layer of interlayer water for the Ca-clay; a fifth layer intrudes to give a less ordered structure. Data for the Na-clay indicate a laminar stacking arrangement for up to three layers of interlayer water. The Na-clay adsorbs more than twice as much water and undergoes four times as large a volume change as the Ca-clay. The free energy change during adsorption of water vapor on the Ca-clay is nearly twice that for the Na-clay. Free energy changes with increasing relative pressure reflect interlayer expansion increments. (Woodard-USGS)

W71-12826

SORPTION OF SOME ANILINES BY Mn-, Co-, Ni-, Cu-, Zn- AND Cd-MONTMORILLONITE,
Hebrew Univ., Jerusalem (Israel). Dept. of Geology.
L. Heller, and S. Yariv.
Proceedings of the International Clay Conference, September 5-10, 1969, Tokyo, Japan, Volume 1; Israel Universities Press, Jerusalem, p 741-755, 1969. 3 fig, 4 tab, 12 ref.

Descriptors: *Soil moisture, *Clays, *Sorption, *Cation exchange, *Montmorillonite, Soil chemical properties, Leaching, Chemical reactions, Ion exchange, Metals, Copper, Cobalt, Manganese.
Identifiers: Nickel, Zinc.

Water molecules play a very important part in the sorption of aromatic amines by clay minerals. Organic molecules are not sorbed in the complete absence of water. Aromatic amines displace most of the water from the interlayers, but water molecules remain coordinated to the interlayer cations. Interlayer transition metal cations coordinate with various anilines either directly (type I) or through water molecules (type II). Infrared spectra showed that the tendency to form type I complexes decreases in the order Cd — Cu, Zn, Ni, Co, and Mn. Five different configurations of metal-amine-water assemblages were postulated and factors affecting the orientation of these assemblages and of 'free' amine in the interlayers were inferred from the basal spacings. Chemical analyses of the products after heating under vacuum at 100 deg C demonstrated that the type of complex formed affects the retention of anilines, but that the thermal stability of all the samples is greater than that of corresponding alkali saturated montmorillonites. (Woodard-USGS)
W71-12827

OVERLAND FLOW ON AN INFILTRATING SURFACE,
Agricultural Research Service, Tucson, Ariz., Southwest Watershed Research Center.
R. E. Smith, and D. A. Woolhiser.
Water Resources Research, Vol 7, No 4, p 899-913, August 1971. 13 fig, 18 ref, append.

Descriptors: *Rainfall-runoff relationships, *Mathematical models, *Overland flow, *Infiltration, *Numerical analysis, Runoff, Parametric hydrology, Hydrograph analysis, Recession curves, Unsteady flow, Runoff forecasting, Hydraulic models.
Identifiers: Hastings (Neb).

The partial differential equation for vertical, one-phase, unsaturated moisture flow in soils is employed as a mathematical model for infiltration rate. Solution of this equation for the rainfall-ponding upper boundary condition is proposed as a sensitive means to describe infiltration rate as a dependent upper boundary condition. A nonlinear Crank-Nicholson implicit finite difference scheme is used to develop a solution to this equation that predicts infiltration under realistic upper boundary and soil matrix conditions. The kinematic wave approximation to the equations of unsteady overland flow on cascaded planes is solved by a second order explicit difference scheme. The difference equations of infiltration and overland flow are then combined into a model for a simple watershed that employs computational logic so that boundary conditions match at the soil surface. The mathematical model is tested by comparison with data from a 40-foot laboratory soil flume fitted with a rainfall simulator and with data from the USDA Agricultural Research Service experimental watershed at Hastings, Nebraska. Good agreement is obtained between measured and predicted hydrographs, although there are some differences in recession lengths. The results indicate that a theoretically based model can be used to describe simple watershed response when appropriate physical parameters can be obtained. (Knapp-USGS)
W71-12829

SOIL WATER HYSTERESIS IN SILT LOAM AND CLAY LOAM SOILS,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
G. C. Topp.
Water Resources Research, Vol 7, No 4, p 914-920, August 1971. 7 fig, 1 tab, 22 ref.

Descriptors: *Soil water movement, *Hysteresis, Hydraulic conductivity, Silts, Clays, Wetting, Drying, Infiltration, Laboratory tests, Moisture content, Soil moisture, Unsaturated flow.

The microhydrologic properties involving water content, pressure head, and hydraulic conductivity were measured simultaneously for a silt loam and for a clay loam soil. Large hysteresis was found in the water content-pressure head relationship for both soils, the silt loam soil showing the larger amount. There was no measurable hysteresis in the relationship between hydraulic conductivity and water content in either soil. The data from the clay loam soil showed considerable scatter attributed to structural rearrangement in the soil during measurement. A formulation of the independent domain theory by Everett was unsatisfactory for predicting the observed scanning curves in the water content-pressure head relationships of both soils. A theorem of an alternative formulation by Enderby was tested by comparing differences in slopes for reversals from drying to wetting along the main curves to those found on a scanning curve; Enderby's formulation was probably no better for the silt loam soil under the conditions of test than that of Everett. (Knapp-USGS)
W71-12830

COMPARISON OF EMPIRICAL RELATIONSHIPS BETWEEN PRESSURE HEAD AND HYDRAULIC CONDUCTIVITY AND SOME OBSERVATIONS ON RADIALLY SYMMETRIC FLOW,
Agricultural Research Service, Madison, Wis.
P. A. C. Raats, and W. R. Gradner.
Water Resources Research, Vol 7, No 4, p 921-928, August 1971. 6 fig, 1 tab, 20 ref.

Descriptors: *Soil water movement, *Hydraulic conductivity, *Pressure head, *Steady flow, Mathematical studies, Darcys law, Unsaturated flow, Soil physical properties, Saturated flow.
Identifiers: *Matric flux potential, *Partially saturated flow.

It is shown that the critical pressure head used by Bouwer is equal to the difference in matric flux potential at pressure heads zero and minus infinity, divided by the hydraulic conductivity at pressure head zero. The critical pressure head and the saturated hydraulic conductivity are used to define dimensionless pressure head, hydraulic conductivity, and matric flux potential. For six empirical relationships between pressure head and hydraulic conductivity, the associated matric flux potential and critical pressure head are evaluated. The plots of the dimensionless hydraulic conductivity and matric flux potential versus pressure head provide a clear basis for comparing the six models. A discussion of steady radially symmetric flow illustrates matric flux potential and the critical pressure head in flow problems. Expressions are obtained for the steady flux, the maximum steady flux, and the change in steady flux as a function of changes in pressure head at two points. One-dimensional, cylindrically symmetric, and radially symmetric flows are discussed as special cases. The results for the radially symmetric case suggest a new method for in situ determination of the hydraulic conductivity as a function of the pressure head. (Knapp-USGS)
W71-12831

INFLUENCE OF THE UNSATURATED FLOW DOMAIN ON SEEPAGE THROUGH EARTH DAMS,
IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 08D.
W71-12832

THE INFLUENCE OF THE UNSATURATED FLOW DOMAIN ON SEEPAGE THROUGH EARTH DAMS,
For primary bibliographic entry see Field 08D.
W71-12890

OBSERVATIONS ON THE OYSTER CULTURE SOILS IN THE ARCACHON BASIN (SW FRANCE),
Jean-Pierre Deltreil.
Rev Trav Inst Peches Mar. 23 (3): 343-349. Illus. Map. 1969.
Identifiers: Arcachon, Basin, Culture, Factor, France, Oyster, Soils, Southwestern.

The chemical and physical characteristics of sandy beach soils of the shoreline and the interior of the islands where the cultivated oyster colonies are found are described. The role of the soil as a possible influencing factor and not just an inert substrate is discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12911

SOME CHARACTERISTIC ASPECTS OF MICROCLIMATE ON SALINE AND ALKALI SOILS IN THE ZONE BETWEEN MURES AND CRISUL ALB,
Institutul Agronomic din Timisoara (Rumania).
For primary bibliographic entry see Field 03C.
W71-12941

RAPID MEASUREMENT OF HYDRAULIC CONDUCTIVITY CHANGES IN SLOWLY PERMEABLE SOILS,
Department of Agriculture, Fresno, Calif. Soil and Water Conservation Research Div.
H. I. Nightingale, and W. C. Bianchi.
Soil Sci. 110 (4): 221-228, 1970.
Identifiers: Conductivity, Gage, Hydraulic, Measurement, Permeable, Permeameter, Pressure, Soils, Strain.

A strain gage pressure permeameter and support equipment for automation is described for measuring in 2-50 min low soil hydraulic conductivity in the range of 0.01 to 0.00001 cm/day for a confined saturated soil layer. Accuracy is within 1 to 2% of that obtained by discharge observations using a constant head. The system is ideal for studies of effect of water quality on time rate of change in hydraulic conductivity under controlled conditions.--Copyright 1971, Biological Abstracts, Inc.
W71-12942

RESONANCE - CAPACITANCE SOIL MOISTURE METER,
Technical Univ. of Prague (Czechoslovakia).
V. Kuraz, M. Kutilek, and I. Kaspar.
Soil Sci. 110 (4): 278-279, Illus, 1970.
Identifiers: Capacitance, Meter, Moisture, Resonance, Soil.

The resonance frequency, f, of a LC circuit, f — (1/(2 Π)) (sq. rt. of (1/LC)) is used in the construction of a resonance - capacitance soil moisture meter; L is the inductance of a constant value, C the capacitance. The dielectric of the capacitor is formed by the glass of the tube and by the soil inserted in the tube. For measuring, a grid deep meter is used. The passive L-C circuit is freely inductionally bound with the active circuit of the grid deep meter. If the passive circuit is in resonance with the oscillator of the grid deep meter, the maximum decrease of energy will occur in the oscillator circuit. The passive circuit is not influenced by the measuring circuit as happens for the other capacitance methods. The moisture content in loess and silty sand was measured without disturbing the soil body. The calibration curves of the dependence of the soil moisture upon the resonance frequency are represented either by a straight line or by a curve of a very low curvature. The sensitivity is roughly the same in all the range of the moisture content and the maximum error is about 1.5% of moisture.--Copyright 1971, Biological Abstracts, Inc.

W71-12943

IMPORTANCE OF PULSE-HEIGHT ANALYSIS IN THE GAMMA-RAY ATTENUATION TECHNIQUE FOR MEASUREMENT OF SOIL MOISTURE,
Ohio State Univ., Columbus, Ohio.
G. S. Saxena, and R. E. Franklin.
Soil Sci. 110 (4): 283-286, Illus, 1970.
Identifiers: Attenuation, Gamma-Ray, Height, Measurement, Moisture, Pulse, Soil, Technique.

This study showed that when long, narrow slits are used to collimate the gamma-ray beam, soil moisture can be measured by the gamma-ray attenuation technique without a pulse-height analyzer and without a calibration curve. A scintillation detector-preamplifier and scaler would comprise a suitable detection system. In the typical laboratory set-up there is sufficient scattering of photons which is not eliminated from being counted by a pulse-height analyzer, to seriously affect the determination of the absorption coefficients. However, these scattered radiations can be eliminated by the use of a narrow slit in front of the detector.--Copyright 1971, Biological Abstracts, Inc.
W71-12944

TENSILE STRENGTH OF CLAY FILMS: A MEASURING TECHNIQUE,
Minnesota Univ., St. Paul. Dept of Soil Science.
R. H. Dowdy and W. E. Larson.
Soil Sci Soc Amer Proc. 34 (6): 848-850. Illus. 1970.
Identifiers: Axial, Clay, Energy, Films, Measuring, Montmorillonite, Strain, Strength, Technique, Tensile.

A technique is presented for quantitatively measuring tensile strength and axial tensile strain of clay films over a relative water vapor pressure range (P/Po) from 0.02 to 0.92. The tensile strain energy is calculated from these data. With this technique, relative electrostatic and chemical interactions of different clay systems can be assessed with a minimum interference from frictional force compounds. Data for Mg-montmorillonite showed a maximum tensile strength of 210 kg/sq cm at P/Po — 0.02, exhibited an axial strain of 173 micron/cm and required 0.22 joules/cu. cm of tensile strain energy to rupture.--Copyright 1971, Biological Abstracts, Inc.
W71-12996

THE INFLUENCE OF SOIL WATER MATRIC POTENTIAL ON THE STRENGTH PROPERTIES OF UNSATURATED SOIL,
Manitoba Univ., Winnipeg. Dept. of Soil Science.
J. Williams and C. F. Shaykewich.
Soil Sci Soc Amer Proc. 34 (6): 835-840. Illus. 1970.
Identifiers: Compressive, Matric, Moisture, Potential, Retention, Shear, Soil, Strength, Stress, Unsaturated, Water.

From an evaluation of the effective stress parameters C' and phi', and the unconfined strentth, the shear strength, effective stress, and the X factor were estimated as a function of soil water matric potential over the range -0.59 to -15.1 bars. The strength properties of a Gretna clay increased rapidly with decreasing matric potential. In a Wellwood loam, however, the strength properties remained relatively constant over the range -0.59 to -15.1 bars. The influence of matric potential on the strength properties of an unsaturated soil can be described in terms of the contribution that matric potential makes to the effective stress operating in the soil system. A measure of the proportion of the matric potential operative in the effective stress is given by the X factor which is related to the degree of saturation. Therefore, the influence that matric properties of the soil. The implications arising from the contribution that matric potential makes to the strength properties of an unsaturated soil are briefly discussed in terms of soil-plant relations.--Copyright 1971, Biological Abstracts, Inc.
W71-12998

2H. Lakes

EVAPORATION FROM WATER STORAGES.
Australian Water Resources Council, Canberra.
For primary bibliographic entry see Field 02D.
W71-12276

AN INVENTORY AND STUDY OF BEAVER IMPOUNDED WATER IN MISSISSIPPI,
Mississippi State Univ., State College. Dept. of Wildlife Management.
D. H. Arner, J. Baker, D. Wesley, and B. Herring.
Proceedings of 23rd Annual Conference of the Southeastern Association of Game and Fish Commissioners, p 110-128, 1969. 19 p, 8 fig, 7 tab, 12 ref. OWRR Project A-047-MISS (1).

Descriptors: *Impoundments, *Ponds, *Beavers, *Water quality, *Mississippi, Dams, Water supply, Chemical analysis, Water yield, Water levels, Water chemistry, Soil chemistry, Hydrologic data, Vegetation, Fish.
Identifiers: *Dams (Beavers), *Impoundments (Beavers).

The water supply of 56 randomly selected beaver pond areas in Mississippi was checked. Seventy-one percent of the ponds were located on intermittent streams or on seepage areas. Only 29 percent of the ponds were constructed on streams with year around flow of water. It was very evident that without beaver activity there would be considerably less acreage available for fish or wood duck production in Mississippi. Estimates from data of the ponds sampled indicate that 56.5 percent of the total acreage of water impounded in beaver ponds in Mississippi was 2.5 feet or less in depth. In the water chemistry studies, there was no apparent differences between beaver ponds and the feeder streams. Phosphates were less than 0.10 ppm from samples taken during winter, spring, and summer. Nitrates were less than 0.10 ppm, with the exception of the winter sample when they were less than .20 ppm. Low oxygen was common in beaver ponds during the August analysis due very probably to increased organic decay during this period. (Woodard-USGS)
W71-12286

AN ANALYSIS OF THE USER RATES OF AND PREFERENCES FOR THE WATER-BASED RECREATION RESOURCES AT LAKE MACBRIDE STATE PARK IN THE SUMMER OF 1970,
Iowa Univ., Iowa City. Recreation Education Program.
For primary bibliographic entry see Field 06B.
W71-12334

TECHNOLOGICAL EXTERNALITIES, OUTDOOR RECREATION, AND THE REGIONAL ECONOMIC IMPACT OF CAYUGA LAKE,
New York State Coll. of Agriculture, Ithaca. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06B.
W71-12342

BEHAVIOR OF WATER IN A SOUTHWESTERN IMPOUNDMENT,
Oklahoma Univ., Norman. School of Engineering and Environmental Science.
E. H. Klehr.
Available from the National Technical Information Service as PB-202 702, $3.00 in paper copy, $0.95 in microfiche. Oklahoma Water Resources Research Institute Stillwater, Interim Final Report, 1971. 13 p. OWRR A-013-OKLA (1).

Descriptors: *Impoundments, *Watershed management, *Model studies, *Oklahoma, Laboratory tests, Monitoring, Water chemistry, Sediment yield, Geologic control, Multiple-purpose reservoirs.
Identifiers: *Basic impoundment behavior, Thunderbird Lake (Okla).

To provide theoretical and field experience in water chemistry for graduate students and basic information applicable to Oklahoma and the Southwest, the small Lake Thunderbird watershed was studied and analyzed as an integral system. After background information was established for the 256 sq mi watershed, including the hydrogeologic conditions, a simulation model was set up. Results from the first 250 days of model operation indicate that a column-fed laboratory model can function in a manner similar to the lake in monitoring chemical quality and will thus allow the model study to be maintained for a relatively long time. The model studies show that the chemical quality of the water, under steady state conditions, is similar to that of the lake. The model responds to manipulation of various environmental control factors such as impoundment behavior. It was consluded that a laboratory simulation of an impoundment system as a study and predictive tool is possible and can be applied to other small watersheds in the Southwest. (Lang-USGS)
W71-12422

AMBIGUOUS 'GLACIAL' STRIAE FORMED NEAR WATERBODIES,
Waterloo Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 02C.
W71-12466

SHORELINE ALGAE OF WESTERN LAKE ERIE,
Rachel Cox Downing.
Ohio J Sci. 70 (5): 257-276. Illus. Maps. 1970 (recd. 1971).

Descriptors: *Algae, *Chlorophyta, *Cyanophyta, *Lakes, Rhodophyta, Shores.
Identifiers: Arnoldiella-Conchophila, Lake Erie.

The algae of western Lake Erie have been extensively studied for more than 70 yr, but, until this study, conducted between April and Oct., 1967; almost nothing was known of the shoreline as a specific algal habitat. A total of 61 taxa were identified from the shorelines. The (23 Chlorophyta, 37 Cyanophyta, 1 Rhodophyta) found 39 are new records for western Lake Erie, and one, Arnoldiella conchophila Miller, appears to be a new USA record, having been previously reported only from central Russia.--Copyright 1971, Biological Abstracts, Inc.
W71-12489

MEROMIXIS OF LAKE RZEZNIKI IN THE MAZURIAN LAKE DISTRICT,
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland).
Jerzy Zachwieja.
Ekol Pol Ser A. 18 (12): 273-290. Illus, Map, 1970.

Descriptors: *Lakes, *Meromixis.
Identifiers: Poland, Lake Rzezniki, Seasonal.

A limnological description was made of the meromictic lake Rzezniki in the Mazurian Lake District, presenting seasonal variations of physical and chemical elements, with detailed information on their vertical stratification. In some years the thickness of the monimolimnion varies from 6 to 8 m, with a maximum depth of 26 m.--Copyright 1971, Biological Abstracts, Inc.
W71-12499

THE DEPOTS OF LAKE LEMAN IN RELATION WITH THE EVOLUATION OF THE SEDIMEN-

TARY BASIN AND THE CHARACTER OF THE LACUSTRIAN ENVIRONMENT,
Kinneret Limnology Lab., Tiberias (Israel).
Colette Serruya.
Arch Sci (Geneve). 22 (1): 125-254. Illus, Map, 1969.

Descriptors: *Lakes, *Lake morphology, *Sedimentary structures, Biological properties, Chemical properties, Plankton, Carbon radioisotopes, Geologic time, Physical properties.
Identifiers: Carbon-14, Depots, Environment, Switzerland, Lake Leman.

This monograph is divided into 6 major parts. The 1st part is a description of the nature of and of the resistance from erosion of the principal rocks of the basin of Lake Leman. There is a quantitative study of the liquid and solid flow from the Rhone Valley. The 2nd part studies the physical, chemical and biological character of the lacustrian environment. With C-14 a quantitative determination of the amount of autotrophic plankton synthesized annually in the lake was made. The 3rd portion details the examination of the sedimentary base through continuous seismic sounding. The results have permitted the determination of the geologic history of the Lake Leman region and the origin of the lake. Determination of the thickness of the moraine and of the sediments gives a fair idea of the tectonic tendencies of different parts of the lemanic zone and explains certain variations in the rate of sedimentation. In the 4th part the relationships between the surface of the sediment and the nature of the underlying depot are traced. Special attention is paid to the mechanism of S formation and the mode of deposit of trace elements. The 5th part is concerned with the physical study of the sediment and is oriented towards the study of the departure of water within the 1st stages of diagenesis. It is shown how oxidation induces settling. The role of electricity in the process of diagenesis is also portrayed. Finally, various new techniques for the study of sediments are introduced. In the last portion of the work the thermodynamic and energy systems of the lake are explored.--Copyright 1971, Biological Abstracts, Inc.
W71-12500

ON THE MICROFLORA ASSOCIATED WITH PORIFERA IN LAKE FARO (IN ITALIAN),
Messina Univ. (Italy). Istituto di Idrobiologia.
For primary bibliographic entry see Field 05C.
W71-12502

SOME LIMNOLOGICAL FEATURES OF LAKE LANGSJON, BJORKLINGE,
Uppsala Univ. (Sweden). Inst. of Physiological Botany.
For primary bibliographic entry see Field 05C.
W71-12504

ON THE CHEMICAL COMPOSITION OF BOTTOM SEDIMENTS FROM LAKE SHINKI AND LAKE NAKA-UMI, WEST JAPAN: (STUDIES ON THE CHEMICAL COMPOSITION OF SEDIMENTARY ROCKS, 2ND REPORT) (IN JAPANESE),
Ei Omori.
Bull Geol Surv Jap. 20 (7): 463-479. Illus, Maps, 1969 (Engl summ).

Descriptors: *Bottom sediments, *Lakes, *Chemical properties, *Sedimentary rocks.
Identifiers: Japan, Lake Naka-Umi, Lake Shinki.

Chemical analyses were done by conventional chemical methods and the contents of SiO2, Al2O3, TiO2 Total Fe2O3, MgO, CaO, Na2O, K2O, MnO and P2O5 were determined. Judging from the chemical compositions of the bottom sediments, it is concluded that the SiO2.Al2O3 contents are influenced by the topographic features of the surroundings and the MgO.MnO.Total Fe2O3 contents are influenced by the sea water.--Copyright 1971, Biological Abstracts, Inc.
W71-12505

THE AQUATIC VEGETATION OF OHRID AND PRESPA LAKES,
Kiril Micevski.
Acta Mus Macedonici Sci Natur. 11 (4): 61-80. 1969 (Ger summ).

Descriptors: *Aquatic plants, *Aquatic habitats, *Lakes.
Identifiers: Associations, Ceratophyllum-D, Hydrocharis-M, Lakes, Lemna-M, Macrophyte, Myriophyllum-D, Najas-M, Nuphar-D, Nymphoides-D, Ohrid, Potamogeton-M, Prespa, Spirodela-M, Vallisneria-M, Vegetation, Yugoslavia.

Descriptions are given of 6 aquatic plant communities, with tables showing distribution of species at different depths, etc. These are named as: Lemneto-Spirodeletum polyrrhizae salvinietosum, Lemneto-Spirodeletum polyrrhizae aldrovandetosum, Myriophylleto-Nupharetum, Myriophylleto-Nupharetum new subass. Potamnetosum lucentis, Potameto-Najadetum, Potameto-Vallisnerietum potametosum trichoides, Hydrocharideto-Nymphoidetum peltatae, and Ceratophyllo-Potametum crispi.--Copyright 1971, Biological Abstracts, Inc.
W71-12515

OCCURANCE OF THE HARBOUR SEAL, PHOCA VITULINA, LINNAEUS IN THE THLEWIAZA RIVER, N. W. T.,
Fisheries Research Board of Canada, Sainte Anne de Bellevue (Quebec).
Brian Beck, Thomas G. Smith, and Arthur W. Mansfield.
Can Field-Natur. 84 (3): 297-300. Illus. Maps. 1970.
Identifiers: Canada, Fish, Food, Harbor, Northwest, Phoca-Vitulina, River, Seal, Territories, Thlewiaza.

Five seals were seen in Edehon Lake on the Thiewiaza River during the period 20 Aug. to 7 Sept. 1968. The only specimen taken was an 8-yr-old male harbor seal P. vitulina which had been feeding heavily on fish and was in excellent condition. An aerial survey of the river system from Seahole Lake to Hudson Bay showed that, even though harbor seals might live in the lakes and river the year round, they are not isolated from the marine environment.--Copyright 1971, Biological Abstracts, Inc.
W71-12530

NOTES ON THE NATURE PRESERVE AGIGEA LAKE, (M RUMANIAN),
Statiunea de Cercetari Marine, Agigea (Rumania).
V. Ciochia.
Ocrotirea Natur. 13 (2): 183-189. Illus. Map. 1969. (Ger summ).
Identifiers: Agigea, Anas-Angustrirostris, Bean-D, Breeding, Burhinus-Oedicnemus, Corn-M, Cygnus-Spp, Egretta-Spp, Feeding, Haliaetus-Albicilla, Himantopus-Himantopus, Lake, Migration, Nature, Overwinter, Oxyura-Leucocephala, Pelecanus-Spp, Pelobates-Syracus-Balcanicus, Platalea-Leucorodia, Preserve, Recurvirostra-Avosetta, Romania, Tadorna-Spp.

The nature preserve Agigea lake has a large number of bird species. Pelobates syracus balcanicus Karaman, a rare toad in Romania, was observed. One hundred fifty-three were observed in this preserve, and 60 of these breed in the preserve. The remainder were observed during migration or overwintering. Anas angustrirostrias Menetr. and Oxyura leucocephala (Scop.) which breed on the sea were also observed. Among the protected birds are Pelecanus onocrotalus L., P. crispus Brunch., Egretta alba (L.), E. garzetta (L.), Platalea leucorodia L., Cygnus cygnus (L.), C. olor (Gmel.) Tadorna tadorna (L.), T. feruginea (Pall.), Recurvirostra avosetta L., Himantopus himantopus L., Burhinus oedicnemus (L.), and Haliaetus albicilla (L.). It is recommended that during the winter feeding stations with corn, beans and corn residue be placed in the water or on the ice. The scientific, practical, didactic and educational roles of this preserve are discussed. Using present knowledge of the avifauna it is possible to determine the development of this preserve.--Copyright 1971, Biological Abstracts, Inc.
W71-12533

THE LIFE CYCLES OF THREE POLYMORPHIDS (ACANTHOCEPHALA) OCCURRING AS JUVENILES IN HYALELLA AZTECA (AMPHIPODA) AT COOKING LAKE, ALBERTA,
Alberta Univ., Edmonton. Dept. of Zoology.
R. B. Podesta, and John C. Holmes.
J Parasitol. 56 (6): 1118-1123. Illus. 1970.
Identifiers: Acanthocepala, Alberta, Amphipoda, Canada, Cooking, Corynosoma-Constrictum, Cycles, Hyalella-Azteca, Juveniles, Lake, Life, Parasites, Polymorphids, Polymorphus-Contortus, Polymorphus-Trochus, Synonymy.

Three acanthocephalans, Corynosoma constrictum Van Cleave, 1918, Polymorphus contortus (Bremser, 1821), Travassos, 1926, and P. trochus Van Cleave, 1945, infect H. azteca Saussure, 1858, in Cooking Lake, Alberta, Canada. Life cycles of each of these, with morphology of the cystacanths, represent the 1st descriptions of the complete life cycles of P. contortus and P. trochus. The differences in development of P. contortus in H. azteca and Gammarus lacustris Sars, 1865, are described. C. bipapilum Schmidt, 1965, is considered a synonym of C. constrictum. The importance of H. azteca and G. lacustris as intermediate hosts for P. contortus is discussed. Some cystacanths of P. trochus had a cuticular sheath, with hooks in exact duplicate of the proboscis hooks, surrounding the proboscis.--Copyright 1971, Biological Abstracts, Inc.
W71-12540

LIFE CYCLE OF DIAPTOMUS OREGONENSIS LILLJEBORG IN SUNFISH LAKE, ONTARIO,
Waterloo Univ. (Ontario). Dept. of Biology.
H. C. Lai, and J. C. H. Carter.
Can J Zool. 48 (6): 1299-1302. Illus. 1970.
Identifiers: Canada, Cycle, Diaptomus-Oregonensis, Food, Lake, Life, Ontario, Scarcity, Sunfish.

The life cycle of D. oregonensis in a partially meromictic lake was investigated during 1966-68. Three annual generations were produced in each of 1967 and 1968 when conditions were optimal. In 1966 no 3rd generation appeared and D. oregonensis vanished in Sept., presumably after deposition resting eggs. Food scarcity is suggested as the cause of both slow summer development and production of resting eggs.--Copyright 1971, Biological Abstracts, Inc.
W71-12543

LAKE-DWELLING OSTRACODA FROM THE OLIGOCENE (MELANIENTON) FROM HESSE (GERMANY),
G. Carbonnel, and S. Ritzkowski.
Arch Sci (Geneva). 22 (1): 55-81. Illus. Map 1969.
Identifiers: Climatology, Distribution, Dwelling, Germany, Hesse, Lake, Limnocythere-Denticulocythere, Melanienton, New Oligocene, Ostracoda, Paleo, Species, Subgenus, Subspecies.

Thirteen species of oligohaline-lake Ostracoda from the Melanienton (lower Oligocene) in northern Hesse are described and partly pictured in electron microscope photographs. A sub-genus of Limnocythere (DENTICULOCYTHERE), 8 new species (Cytheridella ritzkowskiana, L. (D. asymetrica, Cordocythere prima, Dolerocypris allemanicus, Cypridopsis cyclocypriformae, C. wolfi, C. hessani, Paracandona trapezoides) and 2 new sub-species (Ilyocypris brady proxima, Cyprinotus tenuistriatus straubi) are proposed. Their stratigraphical and geographical distribution is sketched; the paleoclimatological value is discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12546

ON THE STANDING CROPS OF RESTING EGGS OF CLADOCERA IN LAKE YUNO-KO IN AUGUST, 1965 AND MAY, 1966, (IN JAPANESE),
Fisheries Agency, Tokyo (Japan).
Munenao Suginome.
Bull Freshwater Fish Res Lab Tokyo. 19 (2): 95-102. Illus. 1969 Engl summ.
Identifiers: Cladocera, Crops, Eggs, Lake, Resting, Standing, Yuno-Ko.

With the purpose of obtaining from natural lakes and marshes some 'seeds' of Cladocera necessary for the artificial mass culture, the standing crops of resting eggs of Cladocera was surveyed in Lake Yuno-ko, Nikko.--Copyright 1971, Biological Abstracts, Inc.
W71-12547

NEW SPECIES OF MUCOUS SPORES (MYXOSPORIDIA) OF FISH IN SOME RESERVOIRS OF WESTERN GEORGIA, (IN RUSSIAN),
T. N. Chernova.
Vestn Zool. 4 (2): 60-64. Illus. 1970 ; Engl summ).
Identifiers: Fish, Georgia, Mucous, Myxidium-Schulmani, Myxobolus-Baueri, Myxobolus-Crassus, Myxosoma-Lomi, Myxosporidia, New, Parasites, Reservoirs, Rutilus-Rutilus, Scardinius-Erythrophthalmus, Species, Spores, Tinca-Tinca, USSR, Western.

Myxidium schulmani was found in the kidneys of Rutilus rutilus (Linne) and Scardinius erythrophthalmus (Linne) from lakes Paleostomi and Japana. Myxosoma lomi was found in the gills and kidneys of R. rutilus (Linne) from lake Paleostomi. Myxobolus baueri was found in the gills, heart wall, urinary bladder wall, kidneys, gall-bladder wall, liver, spleen, swimming bladder wall, genital glands, intestine wall and vitreous body of Tinca tinca (Linne) from lake Japana. Myxobolus crassus was found in the gills and intestine wall of T. tinca (Linne) from lake Japana. (USSR).--Copyright 1971, Biological Abstracts, Inc.
W71-12548

BIOLOGY AND PRODUCTION OF EURYCERCUS LAMELLATUS (O. F. M.) IN THE LITTORAL ZONE OF LAKE NAROCH (IN RUSSIAN),
Belorussian State Univ., Minsk (USSR).
For primary bibliographic entry see Field 05C.
W71-12550

HYGIENIC CHEMICAL STUDIES ON EFFLUENT WATER: VI. FUNDAMENTAL STUDIES ON HYGIENIC CHEMISTRY OF BRACKISH LAKE, (IN JAPANESE),
Ibaraki Prefecture Inst. of Public Health, Mito, (Japan).
For primary bibliographic entry see Field 05C.
W71-12568

RELATIONSHIP OF THE REGIME CHARACTERISTICS OF LAKES TO THEIR AREAS (Zavisimost' rezhimnykh kharakteristik ozer ot ikh pokazateiya ploshchadi),
Murmansk Hydrometeorological Office (USSR).
Yu. A. Yelshin.
Meteorologiya i Gidrologiya, No 3, p 86-89, March 1971. 2 fig, 2 tab, 6 ref.

Descriptors: *Lakes, *Limnology, *Lake morphology, *Lake morphometry, Lake basins, Water levels, Stage-discharge relations, Ice breakup, Lake ice, Correlation analysis, Regime.
Identifiers: *USSR, Murmansk Oblast, Kola Peninsula, Ice phenomena, Ice regime, Coefficient of correlation.

Observations were conducted on 40 lakes of the Kola Peninsula to establish a relationship between the regime characteristics of the lakes and their areas. The regime characteristics examined were the range of water-level fluctuations and the dates of ice breakup on the lakes. The range of water-level fluctuations was inversely proportional to the relation of lake area to drainage area, expressed as the lake area index K. The coefficient of correlation of this relationship was 0.82. For lakes of the Kola Peninsula which have relatively large drainage areas with small water surface areas (K is less than 0.01), the long-term range of water-level changes exceeded 230-250 cm (Lakes Notozero, Pulozero, and Murdozero); when the K values were 0.1-0.2 or more the range of water-level changes was 100-125 cm (Lakes Umbozero, Munozero and Vyalozero). The relationship of the dates of ice breakup on the lakes to the lake area index was well-defined, with a deviation from the line of the relationship of only 1-3 days when the total difference in the dates of ice breakup on the lakes was 15-20 days. The coefficient of correlation of this relationship was 0.83. The relationship of the regime characteristics of lakes to their areas makes it possible to obtain data on the regime of ungaged lakes with a degree of reliability higher than that obtained by direct analogy. The lake area index, a relatively new concept in hydrology, is a characteristic which must be taken into account in studying lakes and lake regimes. (Josefson-USGS)
W71-12609

GEOPHYSICAL DATA RELATING TO A POSSIBLE PLEISTOCENE OVERFLOW OF LAKE BONNEVILLE AT GEM VALLEY, SOUTHEASTERN IDAHO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07B.
W71-12671

WINTER REGIME OF RIVERS AND LAKES,
Cold Regions Research and Engineering Lab. Hanover, N.H.
For primary bibliographic entry see Field 02C.
W71-12792

MATHEMATICAL SIMULATION OF DISPERSION OF POLLUTANTS IN A LAKE WITH ICE COVER,
Calgary Univ. (Alberta). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W71-12797

A MODEL OF THE HYDROLOGY OF THE LAKES OF THE LOWER GRAND COULEE, WASHINGTON,
Geological Survey, Denver, Colo.
I. Friedman, and A. C. Redfield.
Water Resources Research, Vol 7, No 4, p 874-898, August 1971. 4 fig, 14 tab, 19 ref.

Descriptors: *Mathematical models, *Water balance, *Water chemistry, *Return flow, *Lakes, Washington, Salinity, Saline water systems, Columbia River Basin, Evaporation, Water management (Applied), Groundwater movement, Deuterium, Chlorides, Water quality control, Irrigation water, Tracers, Stable isotopes.
Identifiers: Grand Coulee (Wash).

The lakes that occupy the abandoned gorge of the Columbia River below Dry Falls, Washington, were formerly fed by groundwater and precipitation, and they lost water solely by evaporation. As a result the lower lakes became saline. Since 1951 an inflow of irrigation water from the development of the Columbia Basin Irrigation Project has caused the lakes to freshen. Data on the distribution of deuterium and chloride in the system, on measurements of the flow of water between two of the lakes, and on measurements of the pumpage were used to develop models of the system for preirrigation and postirrigation periods. The models indicate the quantities of water that entered each lake from natural sources and from the irrigation system and that left by evaporation and by flow or seepage between the lakes. The quantities required to maintain the balance of water and chloride in the several lakes and in the system as a whole and the distribution of deuterium and chloride in the lake waters may be calculated. At present 20 million cu m of irrigation water enters the system annually. The flow of water through the lakes is 1.7 of that prior to irrigation. Wells remove from the lakes 2550 tons of chloride annually, which is 25 times the annual inflow; this removal is rapidly reducing the chlorinity of Lake Lenore and Soap Lake. (Knapp-USGS)
W71-12828

ULTRAVIOLET COMBUSTION OF DISSOLVED ORGANIC NITROGEN COMPOUNDS IN LAKE WATERS,
Michigan State Univ., Hickory Corners, W.K. Kellogg Biological Station.
For primary bibliographic entry see Field 05A.
W71-12860

STANDING CROPS AND PRIMARY PRODUCTIVITY OF THE EPIPELON OF TWO SMALL PONDS IN NORTH SOMERSET, U K,
Bristol Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W71-12871

VISUAL OBSERVATION OF FISH BENEATH THE ICE IN A WINTERKILL LAKE,
Wisconsin Univ., Madison. Lab. of Limnology.
For primary bibliographic entry see Field 05C.
W71-12877

AGE, GROWTH, SEX COMPOSITION, AND MATURITY OF WHITE BASS IN BULL SHOALS RESERVOIR,
Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark. South Central Reservoir Investigation.
Alfred Houser, and Horace E. Bryant.
US Bur Sport Fish Wildl Tech Pap. (48/49/50/51/52): 3-11. Illus. 1970.
Identifiers: Age, Arkansas, Brass, Bull, Composition, Growth, Maturity, Reservoir, Roccus-Chrysops, Sex, Shoals, USA, White.

White bass (Roccus chrysops, Rafinesque) in Bull Shoals Reservoir were studied from Oct. 1963 through Jan. 1966 to determine age, growth, sex composition, and maturity. Average calculated total lengths of females at the end of each year of life through 6 yr were 193, 338, 400, 427, 441, and 457 mm and of males 185, 320, 344, 397, 413, and 443 mm. Growth in Bull Shoals is similar to that in other southern waters. Growth was faster but lifespan shorter than in northern waters. Females outnumbered males 1.7 to 1. All 2-yr-old white bass were sexually mature. Most males but only a few females mature at 1 yr. Large fluctuations in year-class strength were evident. The 1961 and 1963 year classes were much stronger than those of 1962 and 1964. --Copyright 1971, Biological Abstracts, Inc.
W71-12907

FOOD HABITS OF FIVE CENTRARCHIDS DURING FILLING OF BEAVER RESERVOIR,
Bureau of Sport Fisheries and Wildlife, Vernal, Utah. Div. of Fisheries Service.
James W. Mullan.
US Bur Sport Fish Wildl Tech Pap. (48/49/50/51/52): 3-16. Illus. 1970.
Identifiers: Algae, Arkansas, Bass, Beaver, Bluegill, Bryozoans, Centipedes, Centrarchids, Crayfish, Earthworms, Filling, Food, Habits, Insects, Missouri, Reservoir, Slugs, Snakes, Sowbug, Spiders, Sunfish, USA.

Stomach contents were examined from 1886 largemouth bass, 334 spotted bass, 1689 bluegills, 918 green sunfish, and 579 longear sunfish from shoreline areas of Beaver Reservoir during 2 of the 1st 3 yr of filling. Quality and quantity of food by seasons and size groups (A50, 50-11, 101-200, and S200 mm in total length (TL)) is related to abundance of the principal forage. Greatest

volumes of food were found in winter-spring months when water level rose and inundated soils for the 1st time; terrestrial earthworms, insects, slugs, spiders, centipedes, sowbugs, and work snakes were major foods in these seasons, particularly of fish 101-200 mm TL. Except for the larger bass, fish had smallest volumes in stomachs in late fall, following a decline that began when water levels stabilized in June. In early summer, largemouth and spotted bass more than 50 mm TL fed mostly on young-of-year threadfin and gizzard shad, and sunfishes fed on aquatic insects. As summer progressed to fall, the larger bass had more crayfish, sunfish, black bass, and bullheads in their diets, and the smaller bass shifted to aquatic insects, microcrustaceans, and terrestrial insects. Minor use of fish as food by larger sunfishes also declined; bluegills depended more on terrestrial insects, crustaceans, snails, bryozoans, algae, and plant detritus; green sunfish more on aquatic insects, crayfish, and algae; and longear sunfish more on aquatic insects, algae, and plant detritus.--Copyright 1971, Biological Abstracts, Inc.
W71-12908

LEACHING LOSSES OF NITROGEN AND POTASSIUM IN POLDERS RECLAIMED FROM LAKE IJSSEL,
IJsselmeerpolders Development Authority, Kampen (Netherlands). Biology Lab.
D. A. Van Schreven.
Plant Soil. 33 (3): 629-643. Map. 1970.
Identifiers: Ijssel, Lake, Leaching, Losses, Netherlands, Nitrogen, Polders, Potassium, Reclaimed.

Mineral losses were estimated at regular intervals by determining the amounts of soluble N and K in the water admitted by locks and inlets and discharged by pumping stations and subtracting N and K added in the rain. From 1959 to 1966 the net annual losses of N in the discharged water in Eastern Flevoland ranged from 18.9 to 33.2 kg N/ha.; in the North Eastern polder annual losses ranged from 16.7 to 33.2 (average 22.1) kg N/ha. Rainfall added annually between 4.8 and 11.8 (average 8.6) kg N/ha to both polders. Net losses from Eastern Flevoland ranged from 9.2 to 21.9 kg/ha and from the North Eastern polder from 10.1 to 24.0 kg N/ha, annually. Drainage water contained principally nitrate N, whereas the discharged water in many cases contained both ammonium and nitrate N, and often more ammonium than nitrate, presumably because the composition of the mineral N in the waterways is changed by the growth and death of algae. From 1962 to 1966 the discharged water removed K from the Eastern Flevoland polder in amounts ranging from 105 to 226 kg K/ha annually; from the North Eastern polder, 47-71 kg K/ha/yr. The rain added from 4.5 to 10.7 kg K/ha annually to both polders. Net losses from Eastern Flevoland ranged from 99 to 219 kg K/ha and from the North Eastern polder from 41 to 67 kg K/ha annually.--Copyright 1971, Biological Abstracts, Inc.
W71-12945

THE DISTRIBUTION OF SULPHUR IN THE MUD OF LAKE VICTORIA,
Rothamsted Experimental Station, Harpenden (England).
C. Bloomfield, G. Brown, and J. A. Catt.
Plant Soil. 33 (2): 479-481. 1970.
Identifiers: Distribution, Lake, Mud, Sulfur, Tanzania, Victoria.

Re-examination of the mud showed the presence of pyrite. Pyritic and organic S were not distinguished by the method used. The organic S content of the mud is much less than previously reported.--Copyright 1971, Biological Abstracts, Inc.
W71-12946

DINEMA AMOEBOIDALE SP. N., DINEMA VIOLENTUM SP. N. AND DINEMA DISPICATUM SP. N. (EUGLENOIDINA). PARASITES OF COPEPODA IN LAKES IN THE ENVIRONMENT OF VILNIUS (LITHUANIAN SSR),
Polish Academy of Sciences, Warsaw. Inst. of Parasitology.
W. Michajlow.
Bull Acad Pol Sci Ser Sci Biol. 18 (2): 111-114. Illus. 1970.
Identifiers: Copepoda, Cycles, Dinema-Amoeboidale, Dinema-Dispicatum, Dinema-Violentum, Environment, Euglenoidina, Lakes, Larvae, Life, Lithuanian-SSR, New, Parasites, Species, Vilnius.

These 3 new species of Dinema, parasitize Copepoda larvae from the lake plankton. D. amoeboidale begins its life cycle in the nauplial eye of larvae and after their destruction it emerges actively from their remains. As a flagellate from D. violentum already undertakes movements in still living larvae. D. dispicatum, however, passively abandon the remains of larvae. The 3 spp. have similar life cycle, the stages of which last nearly the same time, 2 infest the same hosts, but differ considerably morphologically.--Copyright 1971, Biological Abstracts, Inc.
W71-13015

DATA ON THE EPIPHYTIC ALGAE OF THE NEUSIEDLER LAKE (AUSTRIA, HUNGARY),
Vienna Univ. (Austria). Botanisches Institut und Botanischer Garten.
Lothar Geitler.
Osterr Bot Z. 118 (1): 17-29. Illus. 1970.
Identifiers: Algae, Apistonema-Expansum, Austria, Charaesiphon-Subeaqualis, Epiphytic, Hungary, Lake, Neusiedler, New, Porphyridium-Griseum, Species.

A new Cyanophyceae, Charaesiphon subaequalis sp. nov., a new Chrysotrichales, Apistonema expansum sp. nov. and a new Rhodophyceae, Porphyridium griseum sp. nov. all found in Neusiedler Lake are described. Some other algae are also described.--Copyright 1971, Biological Abstracts, Inc.
W71-13017

A COMPARATIVE STUDY OF THE FOOD HABITS OF MICRALESTES ACUTIDENS AND ALESTES DAGETI (PISCES:CHARACIDAE) FROM THE NORTHERN BASIN OF LAKE CHAD,
A. H. Robinson, and Patricia J. Robinson.
Bull Inst Fondam Afr Noire Ser A Sci Natur. 31 (3): 951-964. Illus. Map. 1969.

D
Identifiers: Alestes-Dageti, Basin, Chad, Characidae, Comparative, Food, Habits, Insects, Lake, Micralestes-Acutidens, Northern, Pisces, Plankton, Stomach.

A number of specimens of M. acutidens (Peters) and A. dageti Blache and Miton (Pisces:Characidae) were examined in collections from inshore and offshore areas in the northern basin of Lake Chad. Analysis of stomach contents indicated that offshore populations of both species were feeding on plankton, but the composition of the diets differed considerably. Inshore populations were feeding on a wider range of food items including planktonic organisms, benthic and insect material. The diets of the 2 spp. differed less in relative composition. Micralestes taken at intervals during 24 hr period at a single location showed changes in stomach contents.--Copyright 1971, Biological Abstracts, Inc.
W71-13020

SOME PROBLEMS OF THE ECOLOGY OF BENTHIC NEMATODES (NEMATODA) OF MIKOLAJSKIE LAKE,
Polish Academy of Sciences, Warsaw. Inst. of Zoology.
For primary bibliographic entry see Field 05C.
W71-13023

PRIMARY PRODUCTION IN ALASKA TUNDRA LAKES,
Skidmore Coll., Saratoga Springs, N.Y.
H. H. Howard, and G. W. Prescott.
Amer Midland Natur. 85 (1): 108-123. Map. 1971.
Identifiers: Alaskan, Lakes, Primary, Production, Tundra.

Primary production studies of tundra lakes of the Brooks Range and coastal plain reveal 2 production types. Most lakes had a very low mean rate (20-44 mg C/cu m/24 hr), whereas shallow (ca. 1 m maximum depth) lakes of the coastal plain had very high values (223-285 mg C/ cu m/24 hr). The lakes may be productive for up to 8 mo. but the period may be as short as 4 mo. in lakes that freeze to the bottom. No production was detected in any lake from Dec. through March, though sunlight was available from mid-Jan. The highest production rates occurred after the period of maximum radiation either under the ice (June) or when lakes were open (July-Sept.).--Copyright 1971, Biological Abstracts, Inc.
W71-13032

THE MILLER METHOD FOR OXYGEN DETERMINATION APPLIED TO SALINE LAKES,
Monash Univ., Clayton (Australia). Dept. of Zoology.
K. F. Walker, W. D. Williams, and U. T. Hammer.
Limnol Oceanogr. 15 (5): 814-815. 1970.
Identifiers: Applied, Determination, Lakes, Method, Miller, Oxygen, Saline.

Winkler's method for O2 analysis is ineffective in saline waters with sufficient carbonate to cause effervescence after acidification. Miller's method does not involve acid and, although less precise, is effective in well-oxygenated waters; it is limited by Ca/Mg interference where EDTA hardness is S ca. 200 meq Ca sq ../liter.--Copyright 1971, Biological Abstracts, Inc.
W71-13034

NOTES ON QUANTITATIVE SAMPLING OF NATURAL POPULATIONS OF PLANKTONIC ROTIFERS,
Cornell Univ., Ithaca, N.Y. Section on Ecology and Systems.
Gene E. Likens, and John J. Gilbert.
Limnol Oceanogr. 15 (5): 816-820. 1970.
Identifiers: Filter, Funnel, Natural, Planktonic, Populations, Quantitative, Rotifers, Sampling.

Water samples from Mirror Lake, New Hampshire, were concentrated with a transparent filtering funnel fitted with different-sized mesh screening. The commonly used No. 20 (75-micro mesh) plankton netting gave significantly low numbers of individuals and biased egg ratios for natural populations of plankton rotifers in the lake.--Copyright 1971, Biological Abstracts, Inc.
W71-13035

PREDATOR-PREY RELATIONSHIPS AND PREDATION RATES FOR CRUSTACEAN ZOOPLANKTERS FROM SOME LAKES IN WESTERN CANADA,
Calgary Univ. (Alberta). Canadian Wildlife Service.
R. Stewart Anderson.
Can J Zool. 48 (6): 1229-1240. Illus. 1970.
Identifiers: Brachinecta-Gigas, Canada Cannibalism, Crustacean, Cyclops-Bicuspidatus-Thomasi, Cyclops-Vernalis, Diaptomus-Arcticus, Diaptomus-Nevadensis, Diaptomus-Shoshone, Lakes, Plankters, Predation, Predator, Prey, Rates, Relationships, Rotifers, Western, Zoo.

Experimental studies on Diaptomus shoshone, D. arcticus, D. nevadensis, cyclops bicuspidatus thomasi, C. vernalis, and Branchinecta gigas show that these predatory species can capture and eat many prey species of various sizes. B. gigas probably combines raptorial with filter feeding and can eat 150 or more smaller crustaceans per day.

Adult D. shoshone, D. arcticus, and D. nevadensis eat up to 12 or more cyclopoids or diaptomids per day. Rotifers are also preferred prey. Predation rates are inversely proportional to prey size. Cannibalism probably causes the uniformity in body size and instar of predaceous diaptomids in some populations. C. vernalis and C. b. thomasi can eat 6 or more prey animals daily, depending on the size of the prey. Predaceous diaptomids and cyclopoids will eat the same prey species at rates which are influences more by hunger than by abundance of prey. Furthermore, each species is a potential predator on the other, where the role of predator or prey is determined by the relative size or instar of the 2 groups. Hence, codominance of the zooplankton by predaceous diaptomid and cyclopoid species is unlikely.--Copyright 1971, Biological Abstracts, Inc.
W71-13095

ASPECTS OF THE LIMNOLOGY OF FIVE SMALL RESERVOIRS IN NEW SOUTH WALES,
Monash Univ., Clayton (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W71-13096

ALKALINE PHOSPHATASES AND PHOSPHORUS AVAILABILITY IN LAKE KINNERET,
Kinneret Limnology Lab., Tiberias (Israel).
For primary bibliographic entry see Field 05C.
W71-13097

THE MORPHOMETRY OF SHIELD LAKES IN SASKATCHEWAN.
Saskatchewan Fisheries Lab., Saskatoon.
Gordon D. Koshinsky.
Limnol Oceanogr. 15 (5): 695-701. Illus. Maps. 1970.
Identifiers: Canada, Environment, Geologic, Lakes, Morphometry, Saskatchewan, Shield.

Morphometric data are presented for 68 lakes on the Precambrian Shield in Saskatchewan. The lakes have a wide range of surface dimensions but share a common history and a distinctive geologic environment. Basin form, insulosity, and lake configuration are examined in relation to lake areas and are found to be dependent. The nature of this dependency is linked to characteristics of lake origin and geology peculiar to the shield region.--Copyright 1971, Biological Abstracts, Inc.
W71-13098

CHEMISTRY AND ORIGIN OF FRESHWATER FERROMANGANESE CONCRETIONS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
Robert C. Hariss, and Arthur G. Troup.
Limnol Oceanogr. 15 (5): 702-712. Illus. 1970.

Descriptors:
Identifiers: Chemistry, Concretions, Electron, Ferro, Fresh, Manganese, Origin, Probe, Water.

Ferromanganese concretions from Grand Lake and Ship Harbour Lake in Nova Scotia and Mosque Lake in Ontario are most common in water 0.5 to 2 m deep. X-ray diffraction studies show the ferromanganese portions of the concretions to be amorphous. Petrographic and electron probe studies of the ferromanganese material reveal chemical banding of Fe and Mn. Bulk chemical analyses indicate that the Fe:Mn ratios of concretions from different sites within a single lake are similar, whereas concretions from different lakes have characteristic Fe:Mn ratios. Trace elements concentrations are different in different lakes and are generally several orders of magnitude less than those of oceanic nodules.--Copyright 1971, Biological Abstracts, Inc.
W71-13099

INCORPORATION OF ORGANIC CARBON BY DAPHNIA PULEX
Manitoba Univ., Winnipeg. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W71-13100

2I. Water in Plants

TWELFTH PROGRESS REPORT OF THE HUMBOLDT RIVER RESEARCH PROJECT,
Nevada Dept. of Conservation and Natural Resources, Carson City. Div. of Forestry.
For primary bibliographic entry see Field 02D.
W71-12282

LOCAL SNOW DISTRIBUTION IS NOT A FUNCTION OF LOCAL TOPOGRAPHY UNDER CONTINUOUS TREE COVER,
Canadian Forestry Service, Edmonton (Alberta).
For primary bibliographic entry see Field 02C.
W71-12428

THE EFFECT OF FERTILIZATION AND IRRIGATION ON THE BIOLOGICAL CHARACTERISTICS OF SOME MEADOW HERBS (IN RUSSIAN),
R. N. Semagina.
Byull Mosk Obshchest Ispyt Prir Otd Biol. 75 (5): 99-104. 1970. (Engl. summ.).

Descriptors: *Crop production, *Irrigation, *Grasslands, Arid lands, *Plant physiology.
Identifiers: Biological, Fertilization, Festuca-Pratensis-M, Herbs, Meadow, Phleum-Pratense-M, Trifolium-Pratense-D, Trifolium-Repens-D.

Mixed sowings on temporary pastures in dry valleys were studied. A maximum mobilization of biological potentialities (number of shoots per sq. m and per area of leaf surface) was achieved for Phleum pratense L. with N fertilizers, for Trifolium pratense L. with P-K fertilizers, and with irrigation and fertilizers for Festuca pratensis Huds, and Trifolium repens L.--Copyright 1971, Biological Abstracts, Inc.
W71-12480

SUBSTRATE MOISTURE LEVELS FOR GERMINATION TESTING OF SOME AGRICULTURAL SEEDS,
Instituto Biologico, Sao Paulo (Brazil).
For primary bibliographic entry see Field 03F.
W71-12483

EFFECTS OF SOIL-MOISTURE STRESS ON THE YIELD AND QUALITY OF FLOUR FROM WHEAT (TRITICUM AESTIVUM L.),
Arizona Univ., Tucson. Agricultural Experiment Station.
For primary bibliographic entry see Field 03F.
W71-12485

INFLUENCE OF SOIL WATER REGIMES ON THE GROWTH AND NUTRIENT UPTAKE BY RICE (ORYZA SATIVA),
Indian Inst. of Tech., Kharagpur.
For primary bibliographic entry see Field 03F.
W71-12486

EFFECT OF THE CHLORCHOLINECHLORIDE (CCC) ON WINTER WHEAT YIELDS, (IN BULGARIAN),
Higher Inst. of Rural Economics, Sofia (Bulgaria).
For primary bibliographic entry see Field 03F.
W71-12487

YIELD-DETERMINING PROCESS ANALYSIS AND APPLICATION TO LOWLAND RICE, YIELD-PREDICTION AND CULTURAL IMPROVEMENT: XCV. NITROGEN DEFICIENCY EFFECTS IN MIDDLE GROWTH PERIOD ON PHYSIOLOGICAL ACTIVITY OF RICE PLANT ROOTS,
National Inst. for Agricultural Science, Tokyo (Japan).
Takafumi Hoshino, Seizo Matsushima, and Akio Matsuzaki.
Proc Crop Sci Soc Jap. 39 (3): 337-342. Illus. 1970. (In Jap. with Engl. summ.).

Descriptors: *Plant physiology, Nitrogen, *Crop production, Nutrient requirements, *Root zone.
Identifiers: Deficiency, Growth, Lowland, Middle, Prediction, Rice-M, Roots, Yields.

In water cultures the physiological activity of the roots increase with an increasing amount of air and a decreasing amount of SO4 in the medium. In the absence of N, root activity goes down considerably. When the N supply is reduced to one fifth or one tenth of the normal level, root activity goes down very slightly. In soil culture or under field conditions, varying the N supply hardly depresses root activity. The root activity seems to be influenced by the kinds of soil, drainage and methods of watering. Depression of root-activity by N deficiency in the middle growth period (69-92 in leaf-number index, 43-20 days before heading) can hardly be recognized under actual field conditions, because the N supply is interrupted completely only in very few cases and the soil is usually aerated by the practice of drying up the soil at that time.--Copyright 1971, Biological Abstracts, Inc.
W71-12488

MICROFLORA OF THE THERMAL SPRINGS IN NIAKA BANJA, (IN SERBO CROATIAN),
N.A.
Ljubica Petrovska.
Fragm Balcan Mus Macedonici Sci Natur. 7 (4): 21-30. Illus. 1969. (Ger. summ.).

Descriptors: *Microorganisms, *Thermal springs, *Water temperature.
Identifiers: Calothrix-Elenkinii, Chantrantransia-Chalybea, Chlorella-Sp, Cosmarium-Laeve, Dactylococcopsis-Rupestris, Flora, Gloeocapsa-Spp, Gongrosira-Incrustans, Niska-Banja, Oscillatoria-Princeps-Var-Tenuis, Phormidium-Spp, Synedra-Ulna, Yugoslavia.

The waters of these Yugoslavian thermal springs belong to the group of radioactive homeothermic springs, which are characterized by a composition of Ca and carbonates. The thermal springs are for the most part inclosed in bath complexes so that conditions for the development of the original thermal vegetation do not exist. Species of the groups Cyanophyceae, Chlorophyceae, Diatomeae and Rhodophyceae were found and described. They are: Dactylococcopsis rupestris, Gloeocapsa punctata, G. minuta, Calothrix elenkinii, Oscillatoria princeps, O. okenii, Phormidium tenue, P. ambiguum f. majus, P. corium, Chlorella sp. Gongrosira incrustans, Cosmarium laeve, Synedra ulna and Chantrantransia chalybea var. thermalis. A new variety of Oscillatoria princeps was found (var. tenuis), which deviates from the species type by the much smaller width of the trichome. A comparison of the microflora of Niska Banja with that of the thermal springs of Macedonia (Greece) shows the greatest similarity with the microflora of Katlanovska Banja. The springs of these 2 areas are characterized by a composition of Ca and carbonates and have similar temperature conditions. This indicates that chemical composition and the water temperature are the most important factors influencing thermal alga associations.--Copyright 1971, Biological Abstracts, Inc.
W71-12491

DESMIDIACEAE IN THE BENTHOS OF THE KRASNOZNAMENSKAYA IRRIGATION SYSTEM CANAL (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
Y. H. Karpezo.
Ukr Bot Zh, 27 (4): 468-472, 1970 (Engl summ).

Descriptors: *Benthos, *Irrigation canals, *Silting, *Calcium carbonate.
Identifiers: Closterium, Cosmarium, Desmidiaceae, Docidium, Krasnoznamenskaya, Penium, Pleurotaenium, Staurastrum, USSR.

A total of 33 spp. and varieties of Desmidiaceae included 15 spp. and 2 var. of Cosmarium, 10 spp. of Closterium, 5 spp. of Staurastrum and 1 spp. each from Penium, Docidium and Pleurotaenium. The maximum density of Desmidiaceae was noted in the terminal sections of the canal which were used for 1-1.5 vegetational periods. Smaller quantities occurred after usage for 2 yr, probably due to silting and CaCO3 deposits.--Copyright 1971, Biological Abstracts, Inc.
W71-12492

THE TRANSFORMATION OF ENERGY BY A STREAM DETRITIVORE, PTERONARCYS SCOTTI (PLECOPTERA),
Bucknell Univ., Lewisburg, Pa. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W71-12493

HYDROBIOLOGICAL AND ICHTHYOLOGICAL RESEARCHES ON THE VILSAN RIVER, AN AFFLUENT OF THE ARGES (IN RUMANIAN),
Societatea de Stiinte Naturale si Geografic din R.S.R., Bucharest.
For primary bibliographic entry see Field 05C.
W71-12501

THE RESISTANCE TO DESICCATION OF TEN SPECIES OF TROPICAL MOSSES,
Nanyang Univ., Singapore. Dept. of Biology.
Anne Johnson, and P. Kokila.
Bryologist. 73 (4): 682-686. 1970.

Descriptors: *Mosses, *Niches, *Plant physiology, *Humid areas, *Tropical regions, Resistance.
Identifiers: Bryum-Coronatum, Calympere-Dozyanum, Calymperes-Longifolium, Desiccation, Dicranodontium-Nitidum, Fissidens-Crassinervis, Humidity, Leucobryum-Sanctum, Leucophanes-Octoblepharoides, Neckeropsis-Lepinea, Pelekium-Velatum, Semibarbula-Orientalis.

Bryum coronatum, Neckeropsis lepinea, Leucophanes octoblepharoides, Dicraodontium nitidum, Pelekium velatum, Semibarbula orientalis, Calymperes dozyanum, C longifolium, Fissidens crassinervis, and Leucobryum sanctum were exposed to a range of humidities from 76% to 10% for 4 hr and then allowed 24 hr to recover. These mosses fell into 2 groups; those with high resistance to desiccation and those with low resistance. Those of the 1st group may be found in ecological niches of low humidity in the tropical forest.--Copyright 1971, Biological Abstracts, Inc.
W71-12510

LEAF-FALL IN A TROPICAL RAIN FOREST,
Queen's Univ., Belfast (Northern Ireland). Dept. of Agricultural Chemistry.
I. S. Cornforth.
J Appl Ecol. 7 (3): 603-608. Illus, 1970.

Descriptors: *Forest management, *Leaves, *Decomposing organic matter, *Tropical regions, *Rain forests, *Nutrients, Nitrogen, Phosphorus, Potassium, Magnesium, Calcium.
Identifiers: Cycling, Leaf-fall, Mora-excelsa-D, Seasonality, Trinidad.

Leaf-fall was measured at monthly intervals in the Mora excelsa rain forests of Trinidad. Leaf-fall fluctuated throughout the year, being heavy from Aug.-Oct. and again from Feb.-April; the later period coincided with the dry season when evapotranspiration exceeded rainfall. Approximately 7000 kg leaves/ha fell in a year; these contained 60 kg N, 3 kg P, 11 kg K, 65 kg Ca and 15 kg Mg. Although small in relation to total nutrient reserves in the forest litter and surface soil, the rapid decomposition of fallen leaves (0.45%/day) is believed to be important in supplying nutrients for subsequent tree growth, since the feeding roots of mora are restricted to the litter layer and the surface 5-8 cm of soi.--Copyright 1971, Biological Abstracts, Inc.
W71-12516

THE HORIZONTAL STRUCTURE OF REED STANDS (PHRAGMITES COMMUNIS) AND ITS RELATION TO PRODUCTIVITY,
Ceskoslovenska Akademie Ved, Prague. Botanicky Ustav.
Josef Petr Ondok.
Preslia (Praha). 42 (3): 256-261. Illus, 1970.
Identifiers: Contagious, Density, Distribution, Horizontal, Pattern, Phragmites-Communis-M, Productivity, Reed-M, Relation, Size, Stands, Structure.

Measurements along a transect through littoral stands of P. communis showed that productivity and density are positively correlated. The density in these stands decreases from the shore. This gradient can be attributed to the accumulation of old plant parts, producing more organic material in some regions of the stand. The spacing of individuals is contagious, the dimensions of the pattern are examined by block size analysis. Clumping is most pronounced in the most productive plots.--Copyright 1971, Biological Abstracts, Inc.
W71-12517

CHANGE IN THE PHYSICOCHEMICAL PROPERTIES OF WATERS IN THE KIEV RESERVOIR AND THEIR EFFECT ON THE PRODUCTIVITY OF PINE (PINUS SYLVESTRIS L.) FORESTS (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Institut Botaniki.
I. O. Davydenko.
Ukr Bot Zh. 274 (4): 528-530. Illus, 1970 (Engl sum).
Identifiers: Forests, Kiev, Physicochemical, Pine-G, Pinus-Sylvestris-G, Productivity, Reservoir, USSR, Waters.

The effect of flooding by waters of the Kiev Reservoir on the natural regeneration of P. sylvestris L. on a sandy island was studied. Self-sowing of P. sylvestris L. which was observed in 1965, a year before final flooding of the reservoir, survived up to 1969 in the littoral zone.--Copyright 1971, Biological Abstracts, Inc.
W71-12519

ECOLOGICAL STUDY OF FUMARIA VAILLANTII LOIS IN THE LANGUEDOC REGION: I. THE EDAPHIC FACTORS,
Montpellier Univ. (France). Faculty of Phyarmacy.
J. Susplugas, M. Lalaurie, G. Privat, and J. Berlan.
Trav Soc Pharm Montpellier. 30 (2): 85-95. Illus, 1970.
Identifiers: Clays, Ecological, Edaphic, France, Fumaria-Officinalis-D, Fumaria-Parviflora-D, Fumaria-Vaillantii-D, Languedoc, Moisture, pH, Sandy.

The edaphic characteristics of favored sites are emphasized, the majority are situated in vineyards. This species grows vigorously and abundantly on exposed, moderately moist, sandy-clayey soils where the pH is around neutrality. Its strict requirements cause it to be less widespread than invading species such as E. officinalis L. or F. parviflora Lmk.--Copyright 1971, Biological Abstracts, Inc.
W71-12520

ECOLOGICAL STUDY OF FUMARIA VAILLANTII LOIS.: II. INFLUENCE OF CLIMATOLOGICAL FACTORS ON ITS GERMINATION AND VEGETATION IN LANGUEDOC,
J. Berlan, J. Susplugas, and M. Lalaurie.
Trav Soc Pharm Montpellier. 30 (2): 97-104. 1970.
Identifiers: Climate, Climatological, Development, Ecological, Edaphic, France, Fumaria-Vaillantii-D, Germination, Humidity, Languedoc, Temperature, Vegetation.

While edaphic factors have a limiting effect on the area of distribution of stations of F. vaillantii, climatic factors which apparently interact with the former are responsible, in the Languedoc region, for the shortness of the vegetative cycle of this species. Climatic factors condition the abundance of germination and the development. Cool humid weather is most favorable during the pregermination period (18 deg C and 67% humidity). The rapid end of the vegetative cycle may be due to decreased humidity. Photoperiodic studies are needed.--Copyright 1971, Biological Abstracts, Inc.
W71-12521

THE EFFECT OF CARP POND DRAINAGE ON THE MACROZOOBENTHOS (IN GERMAN),
Institut fuer Binnenfischerie, Berlin (West Germany).
Detlev Barthelmes.
Z Fisch Hilfswiss. 18 (1/2): 55-80. Illus, 1970 (Engl and Russ summ).
Identifiers: Benthos, Carp, Chironomid, Drainage, Larvae, Macro, Oligochaete, Pond, Survival, Zoo.

The mechanism of survival of chironomid, oligochaete larvae and other benthic organisms in the pond after drainage and their eventual repopulation of the carp pond is discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12524

THE DEVELOPMENT OF BOTTOM FAUNA AND ITS INFLUENCE ON PRODUCTION OF FISH IN BULGARIAN CARP PONDS, (GERMAN),
Institut fuer Susswasserfischzucht, Plovdiv (Bulgaria).
M. Dimitrov.
Z Fisch Hilfswiss. 18 (1/2): 81-86. 1970. (Engl and Russ summ).
Identifiers: Abundance, Bottom, Bulgarian, Carp, Chironomid, Development, Fauna, Fertilization, Fish, Larvae, Oliogochaetes, Ponds, Production, Productivity, Seasonal.

The bottom fauna of Bulgarian carp ponds consists mainly of chironomid larvae and oligochaetes. The greatest biomass of benthos occur in early summer and later in summer it decreases considerably. Planting of both 0.. and 1.. carp has great influence upon the abundance of benthic biomass. Partial fertilization of the ponds with NH4NO3 and Ca (H2PO4)2 increased biomass 2-3 times more. Additional stockings of grass carp considerably augmented the benthos biomass and the fish yield. Under Bulgarian conditions the exploitation of ponds during the whole year increases productivity.--Copyright 1971, Biological Abstracts, Inc.
W71-12526

EPIDEMIOLOGICAL CIRCUMSTANCES WHICH SEEM TO PROMOTE ENTOMOPHTHOROSIS IN THREE APHIDS: APHIS FABAE SCOP., CAPITOPHORUS HORNI BORNER AND MYZUS PERSICAE (SULZ.), (M FRENCH),
Institut National de la Recherches Agronomique, Rennes (France). Laboratoire de Recherches.
J. Missonnier, Y. Robert, and Genevieve Thoizon.
Entomophaga. 15 (2): 169-190. Illus. 1970 (Engl summ).
Identifiers: Aphids, Aphis-Fabae, Artichoke-D, Capitophorus-Horni, Circumstances, Climate, Entomophthora-Aphidis, Entomophthora-Fresenii, Entomophthora-Planehoniana, Entomophthorosis, Epidemiological, Humidity, Irrigation, Myzus-Persicae, Peach-D, Promote, Temperature, Vicia-Faba-D.

In western France, populations of A. fabae on Vicia faba have been regularly destroyed since 1960 by Entomophthora aphidis and E. fresenii. This also

occurred in 1967, on C. horni on artichokes, due to E. planchoniana and E. aphidis. In the Rhone Valley in 1968, the same fungi attacked M. persicae on peach trees. In Brittany, entomophthoroses persist during the whole year, (enzootic phase) DUE TO ANHOLOCYCLIC APHIDS AND CLIMATIC FACTORS, OF WHICH THE RELATIVE HUMIDITY (RH) stays above 90% for more than 8 hr per day, all year round. This is not the case in the Rhone Valley. The outbreak of epizootics depends on both climatic factors and on the aphid population. Epizootics initiate after an extended period of more than 2 days of diurnal, moderate precipitations lasting about 5 hr per day and followed by an increase of maximum temperature above 20 C. In other regions, this will happen when those conditions are preceded by many rainy days with a RH above 90% for more than 10 hr per day. Such epizootics are not considered dependent upon host-density but rather on inoculum density and distribution in the culture. The results suggests a possibility of aphid control by appropriate irrigation programs.--Copyright 1971, Biological Abstracts, Inc.
W71-12531

REFORESTATION AND NUTRIENT RESERVES IN THE HUMID TROPICS,
Queen's Univ., Belfast (Northern Ireland). Dept. of Agricultural Chemistry.
I. S. Cornforth.
J Appl Ecol. 7 (3): 609-615. Illus. 1970.
Identifiers: Burning, Forestation, Humid, Nutrient, Pinus-Caribbaea-G, Re, Reserves, Tropics.

Changes in plant nutrient reserves in leaf litter and surface soil when tropical evergreen seasonal forests and tropical marsh forests are cleared and replanted with Pinus caribbaea were measured. N was lost 4 yr after burning the original forest but after 10 yr the reserves increased to initial values. P reserves decreased for 7 yr and never regained the original value. Increases in K, Ca and Mg reserves caused by burning were lost after 4 yr. Reafforestation decreased nutrient reserves most in the area with steepest slopes and highest rainfall, where 74% of the original reserves were lost in 6 yr.--Copyright 1971, Biological Abstracts, Inc.
W71-12532

SEED DEVELOPMENT AND GERMINATION STUDIES ON SEM (DOLICHOS LABLAB LINN),
Central Arid Zone Research Inst., Jodhpur (India).
Man Singh Manohar.
Indian J Hort. 27 (1/2): 86-92. Illus. 1970.
Identifiers: Development, Dolichos-Lablab-D, Flowering, Germination, Maturity, Pod, Potential, Seed, Sem-D, Water.

The development of D. lablab pods and their parts i.e. seeds and husk are recorded starting from only a few days after flower opening to pod maturity. The major increase in seed weight takes place between 9 to 30 days after flower opening. Their germination experiment on seeds of various maturities under various water potentials revealed that seeds which matured for 24 days were able to germinate better under all water potentials. Less mature seeds were unable to germinate and those more matured gave lesser germination probably due to seed coat cutinization. Seeds of D. lablab in general were susceptible to water potentials lower than -500 joules/kg.--Copyright 1971, Biological Abstracts, Inc.
W71-12539

FRESHWATER OSTRACODES OF CANADA: IV. FAMILIES ILYOCYPRIDIDAE; NOTODROMADIDAE, DARWINULIDAE, CYTHERIDEIDAE, AND ENTOCYTHERIDAE,
Department of Energy, Mines and Resources, Calgary (Alberta). Inland Waters Branch.
L. D. Delorme.
Can J Zool. 48 (6): 1251-1259. Illus. 1970.
Identifiers: Canada, Cytherideidae, Darwinulidae, Entocytheridae, Families, Fresh, Ilyocyprididae, New, Notodromadidae, Ostracodes, Pelocypris-Alatabulbosa, Species, Water.

The family Ilyocyprididae is represented in Canada by 5 spp. belonging to the 2 genera Ilyocypris and Pelocypris, the latter of which is represented by a new species P. alatabulbosa; the Notodromadidae are represented by the 2 genera Notodromas and Cyprois; the Darwinulidae and Cytherideidae are represented by 1 genus each, Darwinula and Cytherissa; the Entocytheridae are represented by Thermastrocythere.--Copyright 1971, Biological Abstracts, Inc.
W71-12542

STUDIES ON FRESHWATER ENTOMOSTRACA IN GREENLAND: IV. A COLLECTION FROM ANGMAGSSALIK, EAST GREENLAND,
Copenhagen Univ. (Denmark). Inst. of Comparative Anatomy and Applied Zoology.
Ulrik Roen.
Medd Om Gronl. 184 (10): 1-17. Illus. 1970.
Identifiers: Angmagssalik, COLLECTION, Distribution, East, Entomostraca, Fresh water, Greenland, Water.

A collection of 14 samples from 10 freshwater localities from Angmagssalik district, southeast Greenland, is discussed. In the collection 12 spp. of Entomostraca were found, 3 of them, Alonella nana, Leptodiaptomus minutus and Bryocamptus (Arcticocamptus) arcticus are new to east Greenland, and Candona rectangula is new to southeast Greenland. A comparison is made between the entomostracal fauna of southwest Greenland, southeast Greenland, and the Scoresby Sund area, and some zoogeographical remarks are given.--Copyright 1971, Biological Abstracts, Inc.
W71-12544

ON THE OCCURRENCE OF PHYLLOGNATHOPUS VIGUIERI (MAUPAS) IN THE GROUNDWATERS OF CURITIBA (BRAZIL), (IN PORTUGUESE),
Parana Univ. (Brazil). Dept. of Zoology.
Hans Jakobi.
Zool Anz. 184 (3/4): 212-216. Illus. 1970 (Engl summ).
Identifiers: Brazil, Curitiba, Groundwater, Phyllognathopus-Viguieri, Waters.

The present report covers a new finding of P. viguieri in southern Brazil. The rostrum in both populations is always longer than the 1st 2 members of the 1st antenna. No size variations could be discovered. Illustrations show antennae, mouth parts and legs in males and females.--Copyright 1971, Biological Abstracts, Inc.
W71-12545

CHARACTERISTICS OF THE PARASITE FAUNA OF PIKE FROM THE PENZHINA RIVER, (IN RUSSIAN),
S. M. Konovalov.
Parazitologiya. 1 (6): 539-546. Illus. 1967 (Engl summ).
Identifiers: Fauna, Host, Myxobolus-Alienus, New, Parasite, Penzhina, Pike, Records, River, Species, Sphaerospora-Minuta.

The parasite fauna of adult pike from the Penzhina river was found to be much poorer in species (9) than that in pike from the European part of the USSR and West Siberia. The parasite fauna of this year's brood from the Penzhina river is rich (22 spp.) however. Most of the parasites listed have not been previously recorded either from adults or from young pike in other waters. Some of the listed parasites are normally specific to the minnow, the only member of the Cyprinidae which occur in the Penzhina; other parasitic species were found only in the Cyprinidae or in the Percidae. Two species are new and belong to genera typical of the Cyprinidae and Cypriniformes (Sphaerospora minuta and Myxobolus alienus). These observation confirm the suggestion of ichthyologists of the existence of an abundant fauna of fishes (Percidae and Cyprinidae) in the basin of the Penzhina in the Upper Tertiary period. Parasites of these fishes are supposed to have left their hosts for the young of pike. In their turn the pike survived the fall of temperature during the glacial period and transgressions of the ocean in the foothill zone of the Paleopenzhina; due to this pike still exist in the basin of the Penzhina river.--Copyright 1971, Biological Abstracts, Inc.
W71-12549

A NEW APPROACH TO THE IMMUNOLOGICAL ANALYSIS OF INVERTEBRATE DIETS,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
J. R. Pickavance.
J Anim Ecol. 39 (3): 715-724. Illus. 1970.
Identifiers: Diets, Dugesia-Tigrina, Immunological, Invertebrate, Method, New.

During an ecological investigation of the planarian Dugesia tigrina an immunological process was developed for analyzing simultaneously the gut contents of an individual planarian for the presence of up to 8 prey species. The complete method is described; the preparation of antigens, production and testing of antisera, and the construction and preparation of miniature Ouchterlony plates are discussed. The new approach is suitable for analysis of the diet of any carnivorous invertebrate, and once the techniques are mastered and the antisera thoroughly tested, it is perfectly possible to set up the process on a production line principle and analyze at least 1000 individual invertebrates in only 8 days work.--Copyright 1971, Biological Abstracts, Inc.
W71-12552

THE INFLUENCE OF DUTCH ELM DISEASE AND PLANT WATER STRESS ON THE FOLIAR NUTRIENT CONTENT OF AMERICAN AND SIBERIAN ELM,
Agricultural Research Service, Delaware, Ohio. Crop Resources Div.
Bruce R. Roberts, and Keith F. Jensen.
Phytopathology. 60 (12): 1831-1833. Illus. 1970.
Identifiers: American, Ceratocystis-Ulmi, Disease, Dutch, Elm, Elm-D, Foliar, Nutrient, Plant, Siberian, Stress, Ulmus-Americana-D, Ulmus-Pumila-D, Water.

Two-year-old seedings of American elm (Ulmus americana) susceptible to Dutch elm disease and Siberian elm (Ulmus pumila) resistant to Dutch elm disease, were inoculated with Ceratocystis ulmi or subjected to plant water stress by withholding water. Nutrient analyses made on the foliage of all seedlings at the end of the experiment showed a significant difference in P and N content between species, but no difference in Ca or K. Inoculated seedlings of both species exhibited significantly lower levels of K and P when compared to stressed and noninoculated control plants. Water-stressed seedlings of both species showed a similar pattern of transpiration for the duration of the experiment. After 4 wk, however, transpiration in inoculated Siberian elm was twice that of inoculated American elm when compared to corresponding healthy plants. The relationship of these findings to the development of symptoms in Dutch elm disease is discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12557

RESPONSES OF STOMATA OF BARLEY AND MAIZE TO PHENYLMERCURIC ACETATE,
Lancaster Univ., Bailrigg (England). Dept. of Biological Sciences.
O. Majernik.
Biol Plant (Praha). 12 (6): 419-423. Illus. 1970.
Identifiers: Acetate, Anti, Barley-M, Growth, Light, Maize-M, Mercuric, Phenyl, Stomata, Transpirant.

A reduction of stomatal aperture in light occurred in leaves of maize after they had been treated with 10-3.5 M phenylmercuric acetate (PMA). Complete closure of the stomata in darkness was prevented, while there was total closure in the controls. Higher PMA concentrations had larger effects. The relative water content (RWC) of barley tissues was slightly reduced 12 hr after treatment with PMA. The transpiration rate observed on PMA-treated barley plants was lower in light and higher in darkness than in untreated plants. Water saturation deficit (WSD) was higher by about 5%, and water holding capacity (WHC) lower (25%) than in untreated plants. The results suggest that the concentration of PMA normally applied as an antitranspirant is unfavorable for healthy growth of maize and barley.--Copyright 1971, Biological Abstracts, Inc.
W71-12559

BLOOD SUCKING ARTHROPODS OF THE RAPOSO RIVER, VALLE, COLOMBIA: II. CULICIDAE,
Universidad del Valle, Cali (Colombia). Faculty of Medicine.
Pablo Barreto, and V. H. Lee.
Caldasia. 10 (49): 407-440. 1969.
Identifiers: Arthropods, Blood, Colombia, Culicidae, Raposo, River, Suckling, Valle, Viruses.

An annotated list is presented of the mosquitoes collected from 1962-66 in the Rio Raposo area, Pacific Colombia, as part of an arbovirus study. A total of 86 species in 16 genera are listed of which 41 species were reared from larvae and pupae collected in a variety of breeding places. Altogether, 26 species are recorded in Colombia for the 1st time. Notes on method of collection, relative abundance and other data are given. Viruses were isolated from 116 of 4727 mosquito pools processed.--Copyright 1971, Biological Abstracts, Inc.
W71-12561

BLOOD SUCKING ARTHROPODS OF THE RAPOSO RIVER, VALLE, COLOMBIA: IV. PSYCHODIDAE,
Universidad del Valle, Cali (Colombia). Faculty of Medicine.
Pablo Barreto.
Caldasia. 10 (49): 459-472. 1969.
Identifiers: Arbovirus, Arthropods, Blood, Colombia, Lutzomyia, Psychodidae, Raposo, River, Suckling, Valle.

Using human bait and light traps, a variety of hematophagous arthropods were collected in rural areas of Buenaventura, Colombia. The purpose of the study was to obtain a better knowledge of the entomological fauna of the Pacific lowlands and to search for arboviruses in the arthropods. Lutzomyia was represented by 19 named species and 3 undetermined species, of which 5 had previously been recorded in Colombia. From the material processed for arbovirus, isolations were made on 7 different occasions.--Copyright 1971, Biological Abstracts, Inc.
W71-12562

EVOLUTION OF THE CULICID FAUNA OF A NEW OASIS OF THE SAHARA (ZELFANA, NORTHERN SAHARA),
Toulouse Univ. (France). Faculty of Medicine and Pharmacy.
M. Benabadji, and G. Larrouy.
Bull Soc Hist Natur Afr Nord. 60 (1/2): 7-9. 1969.
Identifiers: Aedes-Caspius, Anopheles-Hispaniola, Anopheles-Multicolor, Culex-Deserticola, Culex-Theileri, Culex-univittatus, Culicid, Disease, Ditches, Evolution, Fauna, Human, Irrigation, New, Northern, Oasis, Potential, Sahara, Theoboldia-Longeareolata, Vector, Zelfana.

An agricultural complex using artesian irrigations (founded 1948) was found (in 1951) to harbor Anopheles hispaniola, Culex deserticola, Culex theileri and Theoboldia longeareolata. Mosquito larvae, principally found in irrigation ditches and canals, were of T. longeareolata, Aedes caspius, C. univittatus and Anopheles multicolor. The possibility of inciting an outbreak of vector-borne disease through the arrival of infected subjects is discussed, and the need for mosquito control is emphasized.--Copyright 1971, Biological Abstracts, Inc.
W71-12563

APPLICATION OF AN EXTRACTION-TERM MODEL TO THE STUDY OF MOISTURE FLOW TO PLANT ROOTS,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W71-12577

REMOTE DETECTION OF MOISTURE STRESS: FIELD AND LABORATORY EXPERIMENTS,
Iowa State Water Resources Research Inst; Ames.
Richard Eugene Carlson.
Available from the National Technical Information Service as PB-202 823, $3.00 in paper copy, $0.95 in microfiche. Iowa State University Water Resources Research Institute Project Completion Report ISWRRI-37, June 1971. 101 p, 28 fig, 18 tab, 75 ref. OWRR Project A-031-IA (5).

Descriptors: *Remote sensing, *Moisture stress, *Leaves, *Moisture content, *Plant physiology, Analytical techniques, Laboratory tests, On-site investigations, Instrumentation, Water balance.
Identifiers: *Leaf moisture, Leaf reflectivity, Leaf adsorptivity, Leaf transmissivity.

The relationship between the spectral properties of leaves and the water status of leaves from three crop species was studied under laboratory conditions. The wavelength region examined was from 800 to 2,600 millimicrons. Leaf reflectivity and leaf adsorptivity were highly correlated with relative leaf water content. The relationship between leaf transmissivity and relative leaf water content was variable with wavelength. Leaf transmissivity was, however, high correlated with leaf specific densities. Relative leaf water content was estimated from leaf reflectivity. The data indicated that a field reflectometer could be constructed and possibly used to monitor leaf water status. In field experiments leaf temperature was significantly affected by relative leaf water content, air temperature, and vapor pressure deficit. A relative leaf water content by vapor pressure deficit interaction term affected leaf temperature. Air temperature affected leaf temperature by modifying stomatical conductivities and, hence, the leaf transpiration rate. The leaf temperatures of the two soybean varieties were different, dependent upon the dryness of the air. The density of both regular color and infrared color film taken directly above the canopy was related to canopy moisture stress. (Woodard-USGS)
W71-12582

SIMILARITIES OF PERIPHYTON COMMUNITIES ON NATURAL AND ARTIFICIAL SUBSTRATES IN STREAMS,
Connecticut Univ., Storrs. Inst. of Water Resources.
E. W. Hansmann.
Available from the National Technical Information Service as PB-202 877, $3.00 in paper copy, $0.95 in microfiche. Completion Report, June, 1971. 5 p. OWRR Project A-026-CONN (1).

Descriptors: Periphyton, Biomass, *Aquatic habitats, Aquatic life.
Identifiers: *Artificial substrates, *Periphyton communities, *Species composition, Biomass accumulation, *Relative abundance.

Studies have been carried out on the use of the artificial substrate technique as a means of sampling the attached periphyton community in streams. The work involved the comparison of periphyton community composition and biomass accumulation on artificial substrates as it is affected by artificial substrate types, position, and exposure time. These results were then compared to the results obtained from the community on the natural rock in the stream. The data indicates that significant differences in species composition and relative abundance can be obtained on artificial substrates, and these differences may not always reflect the biodynamics of the periphyton community in the stream.
W71-12702

PLANT GROWTH SUPPRESSION ON SALINE MEDIA: INTERACTIONS WITH LIGHT,
Salinity Lab., Riverside, Calif.
R. H. Nieman, and L. L. Poulsen.
Botanical Gazette, Vol. 132, No. 1, p. 14-19, March 1971. 3 fig, 2 tab, 22 ref.

Descriptors: *Salinity, *Plant growth, *Light, *Photosynthesis, Plant physiology, Mode of action, Soil-water-plant relationships, Laboratory tests, Proteins, Light intensity, Sodium chloride, Leaves, Chlorophyll.
Identifiers: *Plant-water relations, *Chloroplasts, *Cotyledons, *Seedlings.

To test the hypothesis that salt and light interact in their effects on green plants, intact plants (bean seedlings) and excised leaves (radish cotyledons) were grown on control and saline (NaCl,-4 bars) media in the dark and at several different light intensities (0.32, 0.70, 0.97, and 1.72 lux/sq. cm). Salinity suppressed light-dependent bean growth processes, but only at saturating light intensities. At low, limiting light intensities it had the unexpected effect of stimulating growth. Both light and salinity reduced shoot water content. NaCl had a slight growth-stimulating effect in the dark which was incremented by light, maximum growth occurring at 0.43 lux/sq cm as reflected by RNA, DNA, and protein levels. At 1.10 lux/sq cm, all measured quantities were suppressed, and probably chlorophyll production as well. Microscopic analysis of pea and bean chloroplasts indicated that salinity had a growth-suppressing effect, probably through delay rather than prevention of growth. While the mechanisms involved in the interactive effects of salt and light on growth are unknown, chloroplasts seem to be the likely target. (Casey-Arizona)
W71-12745

CONTRIBUTION TO THE AUTECOLOGY OF URGINEA MARITIMA IN EGYPT,
Cairo Univ. (Egypt), Faculty of Science; and Chemical Industries Development Co., Cario (Egypt).
K. H. Batanouny, and T. Khalifa.
Phyton, Vol. 14, No. 1-2, p. 45-53, 1970. 3 fig, 4 tab, 12 ref.

Descriptors: *Xerophytes, *Ecology, *Environmental effects, *Productivity, Phenology, Rainfall, Soil types, Ecological distribution, Vegetation, Biological communities, Climatic zones, Semiarid climates, Habitats.
Identifiers: *Egypt.

The squill, U. maritima (L.) Baker, is a commercially valuable medicinal plant which grows in the Egyptian Mediterranean coastal region. There are 2 main varieties, red squills and white squills, which differ in tunic color, leaf shape, length and fruit size. Due to a limited range and increasing demand it may be necessary to cultivate the plant in the future. An ecological investigation was undertaken in order to determine distribution, habitat conditions, phytosociology, and productivity of the species. Leafing is closely correlated with winter rainfall and flowering is initiated after a 3-month dormancy period. The plants occur only within 30 km of the coast where average annual rainfall ranges over 97-149 mm. Red and white squills differ in optimal soil conditions and dominant floristic associations. Red squill productivity in a 100 sq m area was 70 kg for

an average of 430 bulbs and corresponding white squill productivity was 143 kg for 250 bulbs. Reestablishment of a white squill community needs more than 3 years. (Casey-Arizona)
W71-12748

THE ECOLOGY OF RUNNING WATERS,
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 02E.
W71-12842

IDENTIFICATION OF INGESTED GIZZARD SHAD AND THREADFIN SHAD BY GIZZARD DIMENSIONS,
Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark. South Central Reservoir.
Horace E. Bryant, and David I. Morais.
US Bur Sport Fish Wildl Tech Pap. (48/49/50/51/52): 3-5. Illus. 1970.
Identifiers: Dimensions, Dorosoma-Cepedianum, Dorosoma-Petense, Gizzard, Identification, Ingested, Shad, Threadfin.

Gizzard shad (Dorosoma cepedianum) and threadfin shad (D. petenense) remains in predator stomachs can be specifically identified by differences in their gizzard dimensions. A separation line equidistant from the tizzard length-width means of the 2 species in terms of standard deviations is presented, as well as a regression of total fish length on gizzard width. Fairly reliable identification is possible when gizzard widths are greater than 4 mm.--Copyright 1971, Biological Abstracts, Inc.
W71-12909

MICROPLANKTON OF THE MORLAIX AND PENZE RIVERS (NORTHERN BANK OF BRITTANY),
Gerard Paulmier.
Rev Trav Inst Peches Mar. 23 (3): 311-332. Illus. Map. 1969.
Identifiers: Abundance, Bank, Brittany, Diatoms, France, Micro, Morlaix, Northern, Oyster, Penze, Phyto, Plankton, Productivity, Rivers, Seasonal.

Various physicochemical and meteorological factors involved in the seasonal abundance of phytoplankton, mainly diatoms, and how they affect fattening and productivity of oysters in the area are elaborated.--Copyright 1971, Biological Abstracts, Inc.
W71-12912

FOOD OF SEI WHATE (BALAENOPTERA BOREALIS) TAKEN BY JAPANESE WHALING EXPEDITIONS IN THE ANTARCTIC SEASON 1967/68,
Akito Kawamura.
Sci Rep Whales Res Inst. 22. 127-152. Maps. 1970.
Identifiers: Amphipods, Antarctic, Balaenoptera-Borealis, Calanus-Tonsus, Copepods, Euphausia-Superba, Expeditions, Fish, Food, Japanese, Samples, Season, Sei, Stomach, Whale, Whaling.

There were 7119 sei whales taken during the season and from this 117 stomach samples were acquired. Forty to 60% of the total whales taken had empty stomachs. Sei whales generally feed twice a day. A full stomach is 150-200 kg. Stomach contents usually contain only 1 sp. and are not mixed. In northernmost latitudes, Calanus tonsus is the primary food and in southernmost latitudes, Euphausia superba is the principal food. Other copepods, amphipods, euphauside and fish occur at in-between latitudes.--Copyright 1971, Biological Abstracts,Inc.
W71-12917

AN AMPHIPOD, PARATHEMISTO GAUDICHAUDII AS A FOOD OF THE ANTARCTIC SEI WHALE (BALAENOPTERA BOREALIS),
Tokyo Univ. (Japan).
Takahisa Nemoto, and Kwang R. I. Yoo.
Sci Rep Whales Res Inst. 22. 153-158. Illus. Maps. 1970.
Identifiers: Amphipod, Antarctic, Balaenoptera-Borealis, Chain, Copepods, Food, Parathemisto-Gaudichaudii, Plankton, Sei, Whale, Zoo.

This amphipod is abundant in the belt around the Antarctic convergence and is an important food item of sei whales. This amphipod is carnivorous and uses the 3rd peraeopod to capture copepods. The food chain is: phytoplankton-small zoolplankton-copepods-carnivorous amphipod, P. qaudichaudii-sei whales. Other baleen whales in contrast feed on herbivorous euphausids.--Copyright 1971, Biological Abstracts, Inc.
W71-12918

MORTALITY OF FIRST INSTAR LARVAE OF THE EUROPEAN PINE SHOOT MOTH (RHYACIONIA BUOLIANA SCHIFF.) ON WATER-LACKING NEEDLES OF LODGEPOLE PINE (PINUS CONTORTA LOUD.),
Royal Veterinary and Agriculture Univ., Copenhagen (Denmark). Dept. of Zoology.
Peter Esbjerg.
Entomol Scand. 1 (3): 215-218. Illus. 1970.
Identifiers: Drought, European, Instar, Larvae, Lodgepole, Mortality, Moth, Needles, Pine, Pine-G, Pinus-Contorta-G, Rhyacionia-Buolinana, Shoot, St, Waterlacking.

In 8 experiments with 250 larvae of R. buoliana placed on watered and non-watered shoots of P. contorta, a significantly higher percentage of successful larval borings was found on non-watered shoots. The growth rate of larvae seemed to be higher on the drier shoots. The results underline the increased risk of heavy infestations following drought years, give a reason for the rather frequent infestations found on poor soils, and may be used in Denmark as an important parameter for prognoses.--Copyright 1971, Biological Abstracts, Inc.
W71-12950

HIGHER AQUATIC PLANTS IN THEIR ENVIRONMENT: A NEW ORIENTATION,
Limnologische Station Niederrhein in der Max-Planck-Gesellschaft z.F.d.W., Krefeld (West Germany).
Kaethe Seidel.
Rev Roum Biol Ser Zool. 14 (2): 149-156. Illus. 1969.
Identifiers: Aquatic, Environment, Esthetics, Higher, Juncus-M, Landscape, Mentha-D, New, Orientation, Planning, Plant, Plants, Pollution, Protection, Scirpus-M, Town, Water.

According to the findings presented here, after critical evaluation of the landscape and town planning, the author recommends the inclusion of the higher water plants in the efforts of plant protection and from the point of view of esthetics. This protection involves the prevention of water pollution with many different types of matter such as milk, starch and water-oil mixtures. Some of the plants used in the experiments were the Mentha, Scirpus and Juncus species.--Copyright 1971, Biological Abstracts, Inc.
W71-12959

THE RESPONSE OF BLACK CURRANTS TO DIFFERENT SOIL MOISTURE CONDITIONS AND TWO LEVELS OF NITROGENOUS FERTILIZER,
East Malling Research Station, Maidstone (England).
For primary bibliographic entry see Field 03F.
W71-12964

GROWTH AND PRODUCTIVITY OF TAPIOCA (MANIHOT UTILISSIMA): II. STOMATAL FUNCTIONING AND YIELD,
Malaya Univ., Kuala Lumpur (Malaysia).
For primary bibliographic entry see Field 03F.
W71-12965

FRESHWATER OSTRACODES OF CANADA: V. FAMILIES LIMNOCYTHERIDAE, LOXOCONCHIDAE,
Department of Energy, Mines, and Resources, Calgary (Alberta). Inland Waters Branch.
L. D. Delorme.
Can J Zool. 49 (1): 43-64. Illus. 1971.
Identifiers: Canada, Cytheromorpha-Fuscata, Families, Fresh, Limnocythere-Paraornata, Limnocythere-Parascutariense, Limnocythere-Platyforma, Limnocytheridae, Loxoconchidae, New, Ostracodes, Species, Water.

The Limnocytheridae is represented in Canada by 22 spp. belonging to the genus Limnocythere. The following are described as new: Limnocythere (Limnocytherina) paraornata, Limnocythere (Limnocytherina) parascutariense, Limnocythere platyforma. The family Loxoconchidae is represented by the marine-brackish water form Cytheromorpha fuscata.--Copyright 1971, Biological Abstracts, Inc.
W71-12968

RELATIONSHIP BETWEEN THE BEGINNING OF ODONATA EMERGENCE, LEAF GROWTH ON TREES AND WATER TEMPERATURE, IN SAGUENAY,
Joliette Coll. (Quebec).
Luc Fernet, and Jean-Guy Pilon.
Ann Soc Entomol Que. 15 (3): 164-168. Illus. 1970. (Engl. summ.).
Identifiers: Canada, Emergence, Growth, Leaf, Odonata, Relationship, Saguenay, Size, Temperature, Tree, Trees, Water.

In the course of a study on the Odonata of the Saguenay region it was observed that a relationship existed between the beginning of adult emergence and the time when leaves of trees were about 1/2 their size. Emergence was also initiated by a water temperature between 18 and 19 C.--Copyright 1971, Biological Abstracts, Inc.
W71-12974

EXPERIMENTAL STUDY OF RHEOPHILIA IN TRICLAD PLANARIA FROM RUNNING WATER,
Lyon Univ. (France). Faculte des Sciences.
E. Pattee, and M. Bournaud.
Schweiz Z Hydrol. 32 (1): 181-191. Illus. 1970. (Engl. summ.).
Identifiers: Crenobia-Alpina, Dugesia-Gnocephala, Planaria, Polycelis-Felina, Polycelis-Nigra, Rheophilia, Running, Triclad, Water.

Rheophilous character is marked both by a resistance to being torn off the substrate and carried away, and by an indifference to rapid currents. The 4 spp. investigated from the following order, according to their rheophilous character: Crenobia alpina S Dugesia gnocephala S Polycelis nigra S P. felina. The findings suggest possible explanations for the habitat of each species and some irregularities in their altitudinal successions.--Copyright 1971, Biological Abstracts, Inc.
W71-12975

SOAKING INJURY IN LIMA BEANS,
Agricultural Research Service, Fort Collins, Colo. Seed Storage Lab.
E. E. Roos, and B. M. Pollack.
Crop Sci. 11 (1): 78-81. 1971.
Identifiers: Axes, Beans-D, Embryonic, Germination, Imbibition, Injury, Lima, Phaseolus-Lunatus-D, RNase, Soaking.

The water uptake and RNase development is excised embryonic axes of lima beans (Phaseolus lunatus L. cv. 'Thorogreen') during the period 0 to 18 1/2 hr after the start of imbibition was investigated. The impact of temperature, initial axis moisture, and submergence on these processes was studied. In general, RNase development paralleled growth. However, under stress conditions enzyme formation was reduced to a greater degree than was growth. Submergence during the 1st 10 min of im-

bibition appeared to condition the axes to reduced growth and RNase development at a later period. Submergence during the growth period also had an adverse effect on these processes.--Copyright 1971, Biological Abstracts, Inc.
W71-12981

A CRITICAL STUDY OF SENSOR ELEMENT DIFFUSION POROMETERS,
Stirling Univ. (Scotland). Dept. of Biology.
For primary bibliographic entry see Field 07B.
W71-12982

SOME NEW ASPECTS OF THE APPLICATION OF DIELECTRIC SPECTROSCOPY FOR THE STUDY OF A PLANT WATER REGIME,
Kazan State Univ. (USSR).
N. V. Sedykh, and N. N. Ishmukhametova.
Fiziol Rast. 17 (5): 945-949. Illus. 1970. (Engl. summ.).
Identifiers: Apple-D, Di, Electric, Leaves, New, Plant, Potato-D, Pulp, Regime, Spectroscopy, Water, Wheat-M.

Dielectric spectroscopy is suggested for determination of monomolecular, free and intermediate water, and its thermodynamic coordinates are considered in the intact plant tissues. The method for calculation of these values and the corresponding formulae are presented, illustrated with data for some tissues (wheat leaves, pulp of apple fruits and potato tubers). Such thermodynamic coordinates as activation energy and enthalpy of tissue water are calculated at various temperatures (from 10 to 50 C).--Copyright 1971, Biological Abstracts, Inc.
W71-12983

TEMPERATURE COMPENSATED PELTIER PSYCHOROMETER FOR MEASURING PLANT AND SOIL WATER POTENTIALS,
Battelle Memorial Inst., Richland, Wash.
For primary bibliographic entry see Field 07B.
W71-12984

LENTICEL AND WATER ROOT DEVELOPMENT OF SWAMP TUPELO UNDER VARIOUS FLOODING CONDITIONS,
Southeastern Forest Experiment Station, Athens, Ga.
For primary bibliographic entry see Field 04A.
W71-12985

TEMPERATURE DEPENDENCIES AND APPARENT ACTIVATION ENERGIES OF STOMATAL OPENING AND CLOSING,
Michigan State Univ., East Lansing. AEC Plant Research Lab.
Klaus Raschke.
Planta. 95 (1): 1-17. Illus. 1970.
Identifiers: Activation, Air, Cells, Dependencies, Energies, Flow, Guard, Leaf, Light, Opening, Porometers, Sections, Stomatal, Temperature, Zea-Mays-M.

Stomatal opening movements in response to illumination, and stomatal closure following darkening were studied in leaf sections of Zea mays, using airflow porometers. Stomatal opening is characterized by a phase of linear increase of air flow through the leaf (slope — 'opening velocity'); stomatal closure follows a relaxation curve from which a time constant ('closing coefficient') can be derived. Apparent energies of activation, mu, were computed for the opening velocity and for the closing coefficient from stomatal movements recorded at tissue temperatures between 5 deg and 50 deg. It was assumed that the closing coefficient can be used as a measure of the closing force, and that the opening force has to exceed the closing force in order to bring about stomatal opening. For the closing coefficient mu is about 7 kcal/mole and for the opening force between 12 and 18 kcal/mole. Thus, during stomatal opening, metabolism must provide energy to build up a pressure difference between guard cells and the surrounding tissue. The process controlling the velocity of closure is essentially a passive loss of water (and solutes) from guard cells. The mu of 7 kcal/mole found for the closing coefficient is, however, higher than that for the viscosity of water or for the coefficient of self-diffusion of water. It is, therefore, concluded either that water interacts with the cell structures which it has to permeate during stomatal closure, or that the rate of salt loss from guard cells controls the velocity of stomatal closure. The closing force decreases when leaf temperature rises above 35 deg or falls below 15 deg. Therefore, stomata of maize open relatively faster and wider above 35 deg and below 15 deg, and the mu's of the opening velocity appear to be very large above 35 deg (up to 50 kcal/mole) while they have a negative sign below 15 deg.--Copyright 1971, Biological Abstracts, Inc.
W71-12987

CONTRIBUTION TO THE STUDY OF DROUGHT RESISTANCE IN THE GENUS GOSSYPIUM. II. CHANGES IN SOME ENZYMATIC ACTIVITIES,
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre d'Adiopodoume.
Jorge Bravo Vieira-Da-Silva.
Physiol Veg. 8 (3): 413-447. Illus. 1970.
Identifiers: Acid, Alpha, Amylase, Antibiotics, Beta, Catalase, Chloramphenicol, Chloroplast, Cyclo, Drought, Enzymatic, Fraction, Genus, Gossypium-D, Heximide, Invertase, Phosphatase, Resistance, RNase, Soil.

The effect of either osmotic or soil moisture stress on the activity of catalase and of some hydrolytic enzymes (acid phosphatase, RNase, invertase and alpha- and beta-amylases), was studied. The increase in activity can be assigned to an increase in enzyme solubilization and to an increase in total activity. Most of this solubilization affects the enzymes contained in the chloroplast fraction. The drought-resistant species G. anomalum shows a much smaller solubilization of acid phosphatase. Chloramphenicol inhibits part of the total activity of acid phosphatase and RNase under osmotic stress conditions, but has no effect on invertase activity, which is inhibited by cycloheximide.--Copyright 1971, Biological Abstracts, Inc.
W71-12989

FOOD AND WATER CONSUMPTION AND THE REPRODUCTIVE PERFORMANCE OF THE HEAT-ACCLIMATED FEMALE RAT,
Negev Inst. for Arid Zone Research, Beersheba (Israel).
U. A. Sod-Moriah and E. Pollack.
Int J Biometeorol. 14 (3): 293-300. Illus. 1970. (Fr. and Ger. summ.).
Identifiers: Acclimated, Blastocyst, Consumption, Corpora, Cycle, Estrous, Female, Food, Heat, Lutea, Mating, Morula, Performance, Rat, Rate, Reproductive, Water.

Food and water consumption, estrous cycle length and regularity, mating rate, number of corpora lutea and morulae and early blastocytes on day 4 of pregnancy, were studied in a group of heat-acclimated female rats (35 plus or minus 1C). The results were compared with those of rats maintained at control temperature (22 plus or minus 2C). The heat-acclimated animals consumed the same quantity of food per 100 g of body weight as the controls. Water consumption in the heat acclimated animals was higher. Duration of estrous cycle was prolonged by 24% (pA0.001), while the number of days associated with proestrus and estrus smears during the experimental period was smaller by 14% and 20% (pA0.001), respectively. The number of days associated with metestrus and diestrus smears was larger by 25% and 24% (pA0.001) respectively, in the heat-acclimated group as compared with controls. Mating rate was 47% lower (pA0.01) in the 35C group. There was no difference between the 2 groups in the number of corpora lutea, although the number of 4-day old morulae and early blastocysts in the heat-acclimated rats was 25% smaller (pA0.01) than that of the control animals.--Copyright 1971, Biological Abstracts, Inc.
W71-13002

THE LIFE CYCLE OF ACROSIPHONIA GRANDIS (ACROSIPHONIALES, CHLOROPHYTA),
Biologische Anstalt Helgoland (West Germany).
P. Kornmann.
Mar Biol (Berlin). 7 (4): 324-331. Illus. 1970. (Eng. Summ.).
Identifiers: Acrosiphonia-Arcta, Acrosiphonia-Grandis, Acrosiphonia-Sonderi, Acrosiphonia-Spinescens, Acrosiphoniales, Chlorophyta, Codiolum, Cycle, Intermediate, Life, Type.

A. grandis Kjellm. is well characterized by its long rows of intercalary fertile cells. Material obtained from Iceland proved to be very interesting by reason of its peculiar life history. The zygote develops into a codiolum-like stage, which grows directly into an Acrosiphonia thallus at an age of some 20 days without formation of swarmers. The same features have recently been demonstrated by Jonsson in an Icelandic species, identified by him as A. sonderi. From his specimens Jonsson described facultative karyogamy, ascertained by him formerly in other Acrosiphonia species: its absence induces the above-mentioned development, giving rise to a generation of mitohaplontic Acrosiphonia. In contrast, true zygotes of 'Acrosiphonia sonderi' develop into fertile codiolum cells, reproducing themselves by biflagellate swarmers. In A. grandis, facultative karyogamy has not been observed and nuclear fusion occurs in all zygotes. Codiolum stages never produced swarmers. The life history of A. grandis represents an intermediate type between the heteromorphic cycle of species such as A. spinescens (including a true codiolum-sporophyte, and the isomorphic life history of A. arcta, where the zygote develops directly into the filamentous plant.--Copyright 1971, Biological Abstracts, Inc.
W71-13014

DINEMA METABOLICUM SP. N. (EUGLENOIDINA): A PARASITE OF SOME COPEPODA FROM WATER BODIES OF THE LITHUANIAN SSR,
Polish Academy of Sciences, Warsaw. Inst. of Parastitology.
W. Michajlow.
Bull Acad Pol Sci Ser Sci Biol. 18 (2): 107-109. Illus. 1970.
Identifiers: Adult, Bodies, Copepoda, Cyclops, Dinema-Metabolicum, Euglenoidina, Larval, Lithuanian-SSR, Naupliicola, New, Parasite, Parasites, Species, USSR, Water.

A new Euglenoidina species, Dinema metabolicum, was described. It parasitizes larvae and adult cyclops. The flagellate form of this parasite is distinguished, by intense body metabolism. The invasive-mobile stage in the life cycle of this parasite may survive as much as 5 days. In case of coinvasion with Naupliicola sp., the parasitizing shapes of D. metabolicum form envelopes which they abandon later when they emerge from the decomposing body of the host.--Copyright 1971, Biological Abstracts, Inc.
W71-13016

FRESHWATER ALGAE FROM THE ITASCA STATE PARK, MINNESOTA: II. CHRYSOPHYCEAE AND XANTHOPHYCEAE,
Arkansas Univ., Fayetteville. Dept. of Botany.
Richard L. Meyer, and Alan J. Brook.
Nova Hedwigia. 17 (1-4): 105-112. 1969.
Identifiers: Algae, Chrysophyceae, Fresh, Itasca, Minnesota, New, Park, Records, Water, Xanthophyceae.

Included with each species is a notation on its habitat and principle subcommunity. Forty genera and 98 spp. of Chrysophyceae, of which 96 spp. are new to Minnesota and 33 genera with 75 species of

Xanthophyceae are included. Seventy-four of the Xanthophyte species are new to Minnesota.--Copyright 1971, Biological Abstracts, Inc.
W71-13018

FISHES ASSOCIATED WITH DRIFTING KELP, MACROCYSTIS PYRIFERA, OFF THE COAST OF SOUTHERN CALIFORNIA AND NORTHERN BAJA CALIFORNIA,
California Inst. of Tech., Corona del Mar.
Charles T. Mitchell, and John R. Hunter.
Calif Fish Game. 56 (4): 288-297. Illus. Maps. 1970.
Identifiers: Baja-California, California, Coast, Drifting, Families, Fishes, Kelp, Macrocystis-Pyrifera, Mexico, Northern, Off, Predation, Reduction, Southern, USA.

Fifty collections of fishes associated with drift-kelp were made offshore of southern California and Baja California, Mexico, with a miniature purse seine. Twenty-one spp. and 15 families of fishes were represented. Juvenile stages predominated, adults of only 7 of the species were captured. The body coloration of the species was related to the distance they usually maintanined from the drifting kelp plant. Darker colored species remained closer to the kelp than did silvery ones. Most species were probably recruited in the pelagic environment. A laboratory experiment on the effectiveness of kelp in reducing predation indicated that fishes associated with kelp, were pursued less often, for shorter periods, and captured less frequently by a predator.--Copyright 1971, Biological Abstracts, Inc.
W71-13019

ON POIKILOSMOSIS AND ISO-OSMOSIS,
Erlangen-Nuremberg Univ. (West Germany). Zoologisches Institut.
Hermann Remmert.
Z Vergl Physiol. 65 (4): 424-427. 1969. (Engl. summ.).
Identifiers: Animals, Iso, Marine, Osmosis, Poikil.

The internal osmotic concentration of many marine animals depends directly on the concentration of the external medium (the seawater). The animals conform; or they are poikilosmotic. Such animals are frequently described as iso-osmotic or isotonic with their external medium. Poikilosmotic animals are actually slightly hyperosmotic as against their external medium in the normal circumstances of the animal's existence. In the presence of a sublethal hypersaline environment this hyperosmosis cannot be maintained; only in such circumstances does iso-osmosis occur.--Copyright 1971, Biological Abstracts, Inc.
W71-13022

THE PASSIVE DISPERSAL OF VIABLE ALGAE, PROTOZOANS, AND FUNGI BY AQUATIC AND TERRESTRIAL COLEOPTERA,
Southwest Missouri State Coll., Springfield.
Larry E. Milliger, Kenneth W. Stewart, and J. K. G. Silvey.
Ann Entomol Soc Amer. 64 (1): 36-45. 1971.
Identifiers: Algae, Aquatic, Coleoptera, Dispersal, Fungal, Fungi, Nematodes, Passive, Protozoans, Rotifer, Spores, Terrestrial, Viable.

The relative importance of aquatic and terrestrial beetles as passive overland dispersal vehicles for viable algae and protozoans is elucidated. Twenty-three spp. of aquatic beetles, representing the families Haliplidae, Dytiscidae, Gyrinidae, and Hydrophylidae, collected aspetically during overland flights, carried 101 different genera of algae, 20 protozoans, 1 rotifer, and unidentified fungal spores and/or mycelia. Of the 204 inoculae ('washings') made with these beetles, 193 developed populations of algae and/or protozoans. Six of the remainder contained only fungi; only 5 were negative. Sixteen spp. of terrestrial beetles, representing the families Cicindelidae, Carabidae, Cebrionidae, Meloidae, Scarabaeidae, Trogidae, Cerambycidae, and Curculionidae carried 50 different genera of algae, 15 protozoans, and unidentified rotifers, nematodes, and fungi. Seventy-six of the 93 inoculae developed populations represented by combinations of these organisms. Fifteen inoculae contained only fungi; 2 were negative. The average number of genera of algae and protozoans per individual for all 23 aquatic beetle species was 5.8. The 16 spp. of terrestrial beetles carried an average of 3 genera of algae and protozoa.--Copyright 1971, Biological Abstracts, Inc.
W71-13027

STUDY OF SYMBIOTIC RELATIONSHIP BETWEEN SYMBIODINIUM MICROADRIATICUM FREUDENTHAL, ZOOXANTHELLA AND UPSIDE DOWN JELLYFISH, CASSIOPEA SP.,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
W. Lloyd Balderston.
Nova Hedwigia. 17 (1-4). 373-382. 1969.
Identifiers: Auto, Carbon, Cassiopea-Sp, DI, Down, Fixation, Jellyfish, Oxide, Radiography, Relationship, Symbiodinium-Microadriaticum, Symbiotic, Upside, Zooxanthella.

By autoradiographic techniques it was shown that the symbiotic dinoflagellate S. microadriaticum found in Cassiopea sp. photosynthetically fixes CO2 and that some of the extracellular organic products of the algae appear to be passed on to the animal's tissue. The probable importance of these algal products for the host in the nutritionally poor tropical waters is pointed out.--Copyright 1971, Biological Abstracts, Inc.
W71-13030

2J. Erosion and Sedimentation

TRACER STUDIES OF SEDIMENT TRANSPORT PROCESSES,
Geological Survey, Fort Collins, Colo.
R. E. Rathbun, and C. F. Nordin.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, Paper 8364, p 1305-1316, September 1971. 10 fig, 5 tab, 11 ref, append.

Descriptors: *Sediment transport, *Alluvial channels, *Tracking techniques, *Tracers, *Dye releases, Channel morphology, Sedimentation, Dunes, Ripple marks, Particle size, Mixing, Scour, Erosion, Dispersion, Sedimentary structures.
Identifiers: Sediment tracers.

Particles of various diameters and specific gravities were coated with fluorescent dyes and used as tracers to study the transport and dispersion of sand-size particles for the flat-bed condition in the Rio Grande conveyance channel and for a dune-bed condition in the Atrisco Feeder Canal, N. Mex. Particle velocities for the dune bed depended on size but were only weakly dependent on specific gravity. Particle velocities for the flatbed depended on size and specific gravity, and were several orders of magnitude greater than the particle velocities for the dune bed. Lateral mixing of the tracers from a point source was considerably greater for the dune bed than for the flat bed. Vertical mixing of the tracers for the flat bed was limited to the thin layer of material moving near the bed surface, with essentially no penetration into the bed. Vertical mixing for the dune bed occurred to a depth approximately equal to the heights of the dunes.
W71-12255

FLUID-DYNAMIC CONSIDERATION OF BOTTOM MATERIALS,
Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
H. Pazwash, and J. M. Robertson.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, Paper 8374, p 1317-1329, September 1971. 7 fig, 1 tab, 13 ref, append.

Descriptors: *Clays, *Bottom sediments, *Shear drag, *Rheology, *Non-Newtonian flow, Viscosity, Plasticity, Fluid friction, Fluid mechanics, Flow resistance.
Identifiers: Fluid dynamics.

Bottom materials often involve clay-water suspensions with complex rheology. Concentric viscometer analysis at concentrations of 5, 10 and 20% of kaolinite by weight indicate Bingham-plastic-body behavior; Newtonian fluid behavior is evidenced at low concentration and alkalinity. Yield stress and plastic viscosity increase with increase in clay concentration and with decrease in pH. The drag coefficient of spheres and discs in the laminar boundary-layer region (Reynolds numbers below 200,000) indicate negligible non-Newtonian effect above a Reynolds number of 1,000. At lower Reynolds number, a yield stress effect is superimposed. The dependence of this effect on the Hedstrom number is indicated for values of this parameter up to 4,000. The drag effects of spheres and discs are found to be much the same. (Knapp-USGS)
W71-12256

PRELIMINARY IONIUM DATE FROM MARINE TERRACE, FLORIDA,
Florida State Univ., Tallahassee. Dept. of Geology.
R. W. Maxwell, Jr.
Coastal Research Notes, Vol 3, No 5, p 9-10, June 1971. 2 p, 4 ref.

Descriptors: *Sedimentation, *Sedimentology, *Geology, *Radioactive dating, *Florida, Islands, Swamps, Analytical techniques, Uranium radioisotopes.
Identifiers: *Tat's Hell Swamp (Fla), *Franklin County (Fla).

Ionium age determination techniques were used in a dating study of two arcuate sand bodies in Tat's Hell Swamp in Franklin County, Florida. Ionium dating of ironstones is founded on the assumption that in the deposition of iron oxides by groundwater, uranium (U238 and U234) is incorporated, but not thorium (particularly Th 230, 'ionium,' daughter of U234). The age of a given ironstone is a function of the ratio of Th230 activity to U234 activity, corrected for analytical losses and original Th230. The tests showed an age of 134,000 years BP for the ironstone. (Woodard-USGS)
W71-12263

SEDIMENT BUDGET FOR CAPE BLAS SHOAL, FLORIDA,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 02L.
W71-12264

PALEOMAGNETIC CHRONOLOGY OF PLIOCENE--EARLY PLEISTOCENE CLIMATES AND THE PLIO-PLEISTOCENE BOUNDARY IN NEW ZEALAND,
Rhode Island Univ., Kingston. Graduate School of Oceanography; and Victoria Univ. (New Zealand). Dept. of Geology.
For primary bibliographic entry see Field 02C.
W71-12267

ENVIRONMENT PATTERN RECONSTRUCTION FROM SAMPLE DATA: 1. MISSISSIPPI DELTA REGION,
Illinois Univ., Chicago. Dept. of Geological Sciences.
For primary bibliographic entry see Field 07C.
W71-12277

AIDS IN DESIGNING LABORATORY FLUMES,
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 08B.
W71-12366

GEOMORPHOLOGICAL RELATIONSHIPS OF TROPOSPHERICALLY DERIVED QUARTZ IN THE SOILS OF THE HAWAIIAN ISLANDS,
Wisconsin Univ., Madison. Dept. of Soil Science.
M. L. Jackson, T. W. M. Levelt, J. K. Syers, R. W. Rex, and R. N. Clayton.
Soil Science Society of America Proceedings, Vol 35, No 4, p 515-525, 1971. 7 fig, 3 tab, 51 ref.

Descriptors: *Quartz, *Provenance, *Sedimentation, *Dusts, *Hawaii, Soils, Soil types, Aeolian soils, Rainfall, Topography, Particle size, Particle shape, Winds, Geomorphology.

The percentage of quartz in the surface soils developed over mafic (basic) rocks of the Hawaiian Islands varies functionally with the amount and source of rainfall and with landscape elevation and age. The remarkably close similarity of three parameters of quartz in the soils--particle size distribution, morphology, and oxygen isotope abundance--to those of pelagic sediments of the north central Pacific Ocean and tropospheric dusts suggests a common eolian origin and sedimentation through rainfall. (Knapp-USGS)
W71-12375

PEDOTURBATION BY ARTESIAN ACTION,
North Dakota State Univ., Fargo. Dept. of Soils.
For primary bibliographic entry see Field 02G.
W71-12384

COMPOSITION AND WEATHERING OF LOESS MANTLED WISCONSIN-AND ILLINOIAN-AGE TERRACES IN CENTRAL OHIO,
Ohio State Univ., Columbus. Dept. of Agronomy.
A. S. Khangarot, L. P. Wilding, and G. F. Hall.
Soil Science Society of America Proceedings, Vol 35, No 4, p 621-626, July-August 1971. 3 fig, 2 tab, 24 ref.

Descriptors: *Weathering, *Loess, *Glacial drift, *Ohio, Soil formation, Geomorphology, Soils, Iron, Cation exchange, Leaching, Calcium carbonate.
Identifiers: Outwash.

Loess and outwash deposits on relatively high Illinoian-age terraces are more intensively weathered than comparable units of lower level Wisconsin-age terraces. The Illinoian site, particularly in the outwash paleosol, has lower weight percentages of heavy minerals; lower hornblende contents; lower elemental Fe, K, and Ca contents; and more pronounced pedogenic transformation of micas. Subtle weathering trends of elemental Ca, even in the Illinoian paleosol, are attributed to its occurrence in more resistant plagioclase-feldspars. The 50-20 micron light mineral fraction in both loess and outwash units contains appreciably higher quantities of Ti, Zr, and Fe than was originally anticipated. From 50-70% of the Ti, 20-45% of the Zr, and 85-90% of the total Fe occurs in light minerals. Essentially all of the K and 70-90% of the Ca also occurs in this isolate. Loci of Fe, Ti, and Zr in the light minerals have not been established but are postulated to be either micro occlusions of primary minerals in host framework silicates or proxy for other metallic cations in these structures. (Knapp-USGS)
W71-12385

EFFECT OF GROUNDWATER LEVELS ON STRESS HISTORY OF THE ST. CLAIR CLAY TILL DEPOSIT,
University of Western Ontario, London. Dept. of Engineering Science.
For primary bibliographic entry see Field 08D.
W71-12388

RIVERBANK STABILITY STUDY AT THE UNIVERSITY OF ALBERTA, EDMONTON,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
S. Thomson.
Canadian Geotechnical Journal, Vol 7, No 2, p 157-168, May 1970. 8 fig, 3 tab, 15 ref.

Descriptors: *Bank stability, *Groundwater movement, *Slope stability, *Foundation investigations, Hydrogeology, Water levels, Landslides, Mass wasting.
Identifiers: *Edmonton (Alberta), *Canada.

The need for new building sites at the University of Alberta required an investigation of the stability of the valley wall of the North Saskatchewan River. A geologic map and stratigraphic sections show Upper Cretaceous shales and sandstones overlain by preglacial sands and gravels which, in turn, are overlain by till and glacial sediments. A large, buried preglacial valley on the western side of the study area enhances slope stability because it lowers the piezometric surface. Landslide analyses in this area indicate that effective strength parameters are near peak values. On the eastern side of the study area old landslides are revealed by subdued slump topography. Residual strength parameters used in an infinite slope analysis result in low factors of safety. (Knapp-USGS)
W71-12389

REGIONAL GEOLOGY AND LANDSLIDES IN THE MARINE CLAY DEPOSITS OF EASTERN CANADA,
Laval Univ., Quebec. Dept. of Civil Engineering.
P. La Rochelle, J. Y. Chagnon, and G. Lefebvre.
Canadian Geotechnical Journal, Vol 7, No 2, p 145-156, May 1970. 10 fig, 19 ref.

Descriptors: *Hydrogeology, *Water chemistry, *Landslides, *Clays, *Leaching, Groundwater movement, Engineering geology, Topography, Aquifers, Clay minerals, Mass wasting, Confined water, Springs, Discharge (Water), Glacial drift.
Identifiers: *Canada.

A detailed inventory of the numerous landslides which have taken place in the Province of Quebec show that they are concentrated in given areas. Extensive studies carried out in three different areas reveal a coincidence between the concentration of landslides and the existence of valleys in the bedrock underlying the clay deposits. Piezometric levels measured on the field consistently show the prevalence of a downward gradient in the upper part of the slope and an upward gradient with artesian pressure at the toe. These flow conditions, which can be imputed in part to the presence of the valley in the bedrock, cause leaching of the salt from the pore water of the clay, resulting in decrease of the shear strength and increase of sensitivity. (Knapp-USGS)
W71-12390

STATISTICAL ANALYSIS OF THE PARTICLE-SIZE COMPOSITION OF BOTTOM SEDIMENTS,
G. A. Petukhova.
Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No. 175, 1969, pp. 124-136. Soviet Hydrology: Selected Papers, No 6, p 533-540, 1969. 8 p, 1 fig, 6 tab, 18 ref.

Descriptors: *Particle size, *Analytical techniques, *Statistical methods, Statistics, Bottom sediments, Alluvial channels, Sands, Silts, Gravels, Variability.
Identifiers: *Particle size analysis, USSR, Don River Basin.

To determine the variability of the composition of river bottom sediments, mass measurements of particle-size composition were statistically analyzed. In addition to d10, d25, d50, d75, and d90, the sorting was estimated from the SO value. The following gradations, proposed by Trask, were used: a coefficient SO ranging from 1 to 2.5 for well sorted sediments, SO from 2.5 to 4.5 for medium sorted sediments, and SO greater than 4.5 for poorly sorted sediments. Data were collected on some rivers of the Don basin. This region was selected because it had the longest and most systematic record on the composition of bottom sediments. The initial data were analyzed and estimated in connection with the preparation of the Handbook on Water Resources. In samples represented mainly by sand fractions without gravel, the day and d50 values are close and the day/d50 ratio varies from 1.2 to 3, being greater the higher the percentage of gravel and the coarser it is. If there is more than 50% gravel, its content is reflected in the d50 value; in this case day is less than d50, as a rule, and their ratio is 0.7-0.9. (Knapp-USGS)
W71-12392

OPTIMAL ANGLES OF STREAM JUNCTION: GEOMETRIC, STABILITY TO CAPTURE, AND MINIMUM POWER CRITERIA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
A. D. Howard.
Water Resources Research, Vol 7, No 4, p 863-873, August 1971. 5 fig, 2 tab, 17 ref. GA-454 and GA-1427.

Descriptors: *Channel morphology, *Geomorphology, *Alluvial channels, *Drainage patterns (Geologic), *Tributaries, Rivers, Flood plains, Mathematical models, Topography, Erosion, Sedimentation, Land forming.
Identifiers: Stream junctions.

The angles of junction of streams are adjusted by erosion and sedimentation until the water surfaces and flood plains merge accordantly with each other and with the stream segment continuing downstream. A simplified geometric model of the zone of merger predicts angles of junction by the gradient relationships at the junction. The predicted angles are close to those in badland rill and gully networks. Merging streams with these predicted angles of junction should not be subject to discrete capture by each other or by their downstream continuation. Evaluation of angles of junction with regard to minimum rate of work produces normative equations similar to those predicted by the geometric model. The model streams are within the range of rates of downstream decrease of gradient typical of natural streams. (Knapp-USGS)
W71-12453

A SEDIMENTARY MODEL FOR DETERMINING PALEOTIDAL RANGE,
Illinois Univ., Urbana. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W71-12454

MORPHOLOGY AND SEDIMENTS OF REDONDO SUBMARINE FAN, SOUTHERN CALIFORNIA,
University of Southern California, Los Angeles. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02L.
W71-12456

DELTA: TERM AND CONCEPT,
Chevron Oil Field Research Co., La Habra, Calif.
G. T. Moore, and D. O. Asquith.
Geological Society of America Bulletin, Vol 82, No 9, p 2563-2567, September 1971. 2 fig, 9 ref.

Descriptors: *Deltas, *Geomorphology, *Sedimentation, *Stratigraphy, Deposition (Sediments), Sedimentary structures, Rivers, Sediment transport.

A delta, whether in the present or geologic past, is one segment of a major sediment accumulation, usually occurring on the continental margin. It basically represents the filling of a basin or, in some instances, on a more regional scale, the filling of a geosyncline. In proposing a revised geologic definition this sediment mass is placed within its proper framework, recognizing the importance of post-glacial and pre-glacial marine geomorphology, and considering the many external forces that affect it. Thus, it is recommended that the term delta be redefined as: the subaerial and submerged contiguous sediment mass deposited in a body of water (ocean or lake) primarily by the action of a river. (Knapp-USGS)

W71-12457

EASTWARD SUBMARINE CANYON AND THE SHAPING OF THE BLAKE NOSE,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 02L.
W71-12458

NEARSHORE CELL CIRCULATION AND THE FORMATION OF GIANT CUSPS,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 02L.
W71-12459

STATE-OF-THE-ART OF LITTORAL DRIFT MEASUREMENTS,
Tetra Tech., Inc, Pasadena, Calif.
E. K. Noda.
Shore and Beach, Vol 39, No 1, p 35-41, April 1971. 5 fig, 14 ref.

Descriptors: *Littoral drift, *Ocean currents, *Beaches, *Sediment transport, Reviews, Methodology, On-site investigations, Analytical techniques, Tracers, Sands, Shore protection, Beach erosion.
Identifiers: *Beach development.

The state-of-the-art of littoral drift measurements is reviewed with emphasis on field techniques. The point of view considered concerns a coastal community which is tentatively planning to construct a harbor or some type of beach obstruction which may impede the littoral sand transport. Field methods for measuring littoral drift include natural tracers (heavy minerals and naturally radioactive minerals), artificial tracers (radioisotope sand fluorescent sand tracers), sand traps (groins, breakwaters, jetties, etc., and mechanical traps), and sand budget. (Woodard-USGS)
W71-12468

RIVER EROSION DUE TO CHANNEL RELOCATION,
Federal Highway Administration, Concord, N.H.
For primary bibliographic entry see Field 08B.
W71-12469

THE DEPOTS OF LAKE LEMAN IN RELATION WITH THE EVOLUATION OF THE SEDIMENTARY BASIN AND THE CHARACTER OF THE LACUSTRIAN ENVIRONMENT,
Kinneret Limnology Lab., Tiberias (Israel).
For primary bibliographic entry see Field 02H.
W71-12500

VARIABILITY OF THE CHEMICAL COMPOSITION OF WATER IN PONDS OF VARIOUS DISPOSITION OF THE BOTTOM IN RELATION OF THE LOCAL LEVEL OF EROSION (IN POLISH),
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
Kazimierz Pasternak.
Acta Hydrobiol. 10 (4): 525-532. Illus. 1968 (Engl summ).

Descriptors: *Ponds, Cheical properties, *Water properties.
Identifiers: Disposition, Erosion, Mineral content.

Investigations were made on the water of ponds of various bottom dispositions in relation to the local level of the surface-water flow and ground-water table of the surrounding terrain. In ponds with a basin deeply sunk into the surrounding terrain the water was richer in mineral salts than in those with bottoms at almost the same level as the adjoining grounds. The causes and significance of this phenomenon are discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12503

PARTICLE SIZE SORTING OF PROGLACIAL EOLIAN MATERIALS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 02C.
W71-12575

SOILS AND STRATIGRAPHY OF A PORTION OF THE GOLA RIVER FAN OF UTTARY PRADESH, INDIA,
Illinois Univ; Urbana. Dept. of Pedology.
Richard L. Hurelbrink, and J. B. Fehrenbacher.
Soil Sci Soc Amer Proc. 34 (6): 911-916. Illus. 1970.
Identifiers: Alluvial, Chemical, Fan, Genesis, Gola, India, Mollisols, Piedmont, River, Soils, Stratigraphy, Uttar-Pradesh.

The Gola River fan, formed at the base of the Himalayan Mountains in Nainital District of Uttar Pradesh, India, is composed of strongly to moderately sloping, thin, coarse-textured sediments over stony layers near the foothills and gently sloping, moderately thick to thick, medium-textured sediments over sand and gravel 8-10 km below foothills. The 2 portions of the fan are separated by a spring line. The soils of the upper portion of the fan, which is known as the bhabar, are thin and drouthy. Soils of the lower portion of the fan, which is called the tarai, have good moisture storage capacity and are highly productive. All soils are weakly developed with high pH values and high base saturation. Some leaching of bases, translocation of Fe, and formation of structure has taken place in these soils, but clay movement has been very slight. Mineral alteration has not been great, the high chlorite and mica clay mineral content being inherited from the soil parent materials. Most of the soils in the tarai have mollic epipedons and cambic horizons and are Mollisols. Soils in the bhabar tend to have thinner, dark-colored surface horizons than those in the tarai, and those near the apex of the fan and the foothills are Inceptisols and Entisols.--Copyright 1971, Biological Abstracts, Inc.
W71-12576

PYRITE MICROCONCRETIONS IN BLACK SEA SEDIMENTS (Mikrokonkretsii pirita v osadkakh Chernogo morya),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
I. I. Volkov, A. G. Rozanov, and T. A. Yagodinskaya.
Akademiya Nauk SSSR Doklady, Vol 197, No 1, p 195-198, 1971. 1 tab, 11 ref.

Descriptors: *Geochemistry, *Sediments, *Pyrite, *Clays, *Chemical analysis, Iron compounds, Sulfates, Sulfides, Sulfur compounds, Hydrogen sulfide, Carbon, Organic matter, Saturation, Sea water, Silicates, Calcium carbonate, Diagenesis, Mud-water interfaces.
Identifiers: *USSR, Black Sea, Concretions, Druses, Magnetic properties.

Sulfide formations in the form of nodules, druses, and fossilized bacilli, wood fragments, and algae dendrites were examined at depths of 300-1,300 m in very compact, new euxinic Black Sea clays. The sediments, sampled by a bottom grab, contained less than 1 mg of free hydrogen sulfide/liter. The sulfide content, which indicates the presence of iron monosulfide, was very low (0.01-0.06%). The maximum amount of sulfide (0.06% was due to the presence in the mud of impregnations of high sulfide content. The pyrite sulfur content varied between 0.20 and 1.27%, which attested to the presence of pyrite sediments in all of the samples examined. The amount of sulfates in all samples was practically the same (0.08%) and was determined by the sulfate content in the water which saturated the muds. The CaCO3 content of the sediments was 13.2-33.0%. The organic carbon content varied between 0.40 and 0.93%, which is typical of new euxinic sediments. Reactive iron, readily soluble in diluted sulfuric acid, was represented mainly by bivalent iron; the Fe (3) content was only 0.02-0.05%. The iron sulfide concretions in nonmagnetic samples were practically pure pyrite. The concretions in magnetic samples contained pyrite and varying amounts of sulfides representing transitional forms from monosulfide to pyrite. All sulfide formations had the character of concretions and thus differed from the finely dispersed pyrite and magnetic sulfides found in recent and ancient Black Sea sediments. (Josefson-USGS)
W71-12612

DISTRIBUTION OF MULTISTAGE DECOMPOSITION PRODUCTS OF ORGANIC MATTER IN BOTTOM SEDIMENTS (Raspredeleniye produktov mnogostadiynogo raspada organicheskogo veshchestva v donnykh otlozheniyakh),
Limnologicheskii Institut, Irkutsk (USSR).
L. M. Galkin, and I. B. Mizandrontsev.
Akademiya Nauk SSSR Doklady, Vol 198, No 2, p 423-425, 1971. 2 ref.

Descriptors: *Organic matter, *Bottom sediments, *Sedimentation, *Hydrogeology, Sediment-water interfaces, Decomposing organic matter, Detritus, Groundwater, Hydrolysis, Diffusion, Boundaries (Surfaces).
Identifiers: *USSR, Decomposition products.

Quantitative patterns which determine the content and distribution of the decomposition products of organic residues in the liquid phase of bottom sediments are described. The organic matter of groundwater solutions may be considered to be the first intermediate decomposition product, formed during partial enzyme hydrolysis of solid organic residues. Distribution of the first intermediate product in groundwater solutions is a function of (1) the sediment accumulation rate; (2) the organic residue content of the sediment; (3) the decomposition constants of the solid organic detritus and its decomposition product; and (4) the concentration and coefficient of diffusion of the decomposition product at the sediment-water interface. Sediment distribution of the original organic detritus and its decomposition products, including the end products, is the result of a simultaneous accumulation, decomposition and diffusion of the sediments. (Josefson-USGS)
W71-12614

QUANTITATIVE PROPERTIES OF DELTA CHANNEL NETWORKS,
IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.
J. S. Smart, and V. L. Moruzzi.
Available as AD-719 918 from Nat. Tech. Inf. Service, Springfield, Va. 22151--Price $3.00 printed copy, $0.95 microfiche. IBM Thomas J. Watson Research Center Technical Report No 3, January 1971. 27 p, 4 fig, 4 tab, 4 ref. ONR Contract No. N00014-70-C-0188.

Descriptors: *Statistics, *Deltas, *Junctions, *Channel morphology, *Drainage patterns (Geologic), Geomorphology, Statistical methods, Mathematical studies, Tributaries, Braiding.
Identifiers: *Topology, *Distributaries.

Some simple procedures were developed for studying the topologic and geometric properties of delta distributary systems. A delta channel network has three kinds of vertices (forks, junctions, and outlets) and six kinds of links, each corresponding to one of the six possible combinations of upstream and downstream vertices. Functions of the vertex and link numbers may be used to specify the topologic properties of the network. A particularly useful function is the recombination factor, or ratio of number of junctions to number of forks. This ratio varies from zero for networks with no recombination to unity for braided streams. A topologic study of deltas (Colville, Irrawaddy, Yukon, Niger, and Parana) shows recombination factors ranging from 0.5 to 0.85. The frequency of different kinds of links can be explained reasonably well by a model that assumes random connection of vertices.

The link lengths for a given network belong to a common distribution and depend relatively little on location. The Parana has the topologic character of two deltas in tandem, each with its characteristic recombination factor. (Knapp-USGS)
W71-12625

QUANTITATIVE DISTRIBUTION OF SUSPENDED MATTER IN THE ATLANTIC OCEAN (FROM THE SECOND CRUISE OF THE BELOGORSK),
I. P. Svirenko.
Oceanology, (USSR), Vol 10, No 3, p 363-365, December 1970. 4 p, 2 fig, 1 tab, 8 ref.

Descriptors: *Turbidity, *Suspended load, *Atlantic Ocean, Suspension, Provenance, Sampling, Productivity, Streamflow, Sediments, Surveys, Particle size, Water quality, Sedimentation, Oceanography.

On the basis of 472 samples of water suspensions, a quantitative description is given of the content of suspended particles in the water of the Atlantic Ocean. The central portions of the ocean contain water with the lowest concentration of suspended material, from 0.2-0. 3 to 1.0 mg/liter in the surface layer. A slightly higher concentration of suspended particles is observed near islands, over the slopes of seamounts and in areas of massive plankton production. In contrast to the open ocean, the fluctuations of suspended matter concentrations in littoral waters are quite high, from 0.2 to 47.0 mg/liter. The most important factors determining this phenomenon are continental drainage and the direction of currents. The influence of the flow from such large rivers as the Amazon, Orinoco, La Plata, and others is analyzed. (Knapp-USGS)
W71-12630

THE DYNAMICS OF THE RIDGE RELIEF OF THE SUBMARINE SLOPES ON THE NORTHWEST COAST OF THE BLACK SEA,
Odessa State Univ. (USSR).
G. N. Aksent'yev.
Oceanology (USSR), Vol 10, p 340-347, December 1970. 8 p, 6 fig, 3 tab, 6 ref.

Descriptors: *Landslides, *Beach erosion, Surf, Mass wasting, Geomorphology, Waves (Water), Geology, Erosion.
Identifiers: *Black Sea.

About 70% of the total length of the northwest coast of the Black Sea is occupied by abrasional shorelines in which landslide phenomena predominate. The slides occur as a result of the destruction of the natural profile of the submarine coastal slope by wave action. The slide movements are reflected in the morphology of the nearshore part of the coastal slope and sea bottom in the existence and development of three main types of ridges: residual ridges, compression ridges, and squeeze ridges. The dynamics of all three were studied along several cross-sectional profiles. Under shoal-water conditions on the submarine slope, the rate of erosion of one was in the range of 6000-9000 cu m/year; during the first year the volume may have been somewhat greater. As the profile was leveled down, the rate of erosion became slower. (Knapp-USGS)
W71-12631

INVESTIGATION OF THE RELIEF AND BOTTOM DEPOSITS ON THE SOUTHWEST AFRICAN SHELF,
I. K. Avilov, and D. Ye. Gershanovich.
Oceanology (USSR), Vol 10, No 2, p 229-232, November 1970. 4 p, 2 fig, 6 ref.

Descriptors: *Bottom sediments, *Continental shelf, *Deltas, Sampling, Provenance, Sedimentation, Mineralogy, Plankton, Phosphorus, Organic matter, Topography, Sediment transport, Hydrogen sulfide.
Identifiers: *African shelf, *Congo River.

The results of marine geological studies performed on a voyage of the R/V Akademik Knipovich are analyzed. A narrow shelf south of the mouth of the Congo River is characterized by varying composition of sediment. Terrigenous sediment is replaced by carbonaceous sediment in the vicinity of the mouth of the Cunene River. The high concentrations of some of the sediment components are caused by unusual sedimentation factors. Samples taken in zones of the intensive development of diatoms and massive plankton death within the shelf area near Walvis Bay show sediments with abnormally high organic matter content (from 15 to 23%). In the Luderitz area, terrigenous ooze outside the shelf zone contains up to 8.4% elementary phosphorus, much higher than the phosphorus content of known carbonaceous phosphorite platforms on the Agulhas Bank, amounting to about two-thirds of the quantity of phosphorus in phosphorite concretions. On the outer edge of the shelf, to the north of the Congo River mouth and near Luderitz, although the quantity of pelite particles is low (23 and 6.5%), the sediment contains a high quantity of iron (16.5 and 9.9%, respectively). The concentration of iron is apparently related to glauconite (over 80% and about 40%). (Knapp-USGS)
W71-12649

PHOSPHORITE NODULES IN THE BOTTOM SEDIMENTS OF THE GULF OF ADEN,
Akademiya Nauk Nauk URSR, Kiev. Instytut Geologichnykh Nauk. Academy of Sciences of the Ukrainian SSR, Kiev, Institute of Geological Sciences.
V. Kh. Gevork'yan, and Yu. G. Chugunnyy.
Oceanology (USSR), Vol 10, No 2, p 233-241, November 1970. 9 p, 3 fig, 3 tab, 12 ref.

Descriptors: *Bottom sediments, *Indian Ocean, *Phosphates, Mineralogy, Erosion, Provenance, Surveys, Sedimentation, Oceanography, Chemical analysis.
Identifiers: *Phosphorite nodules, *Gulf of Aden.

On its nineteenth voyage in the Indian Ocean in 1966 the R/V M. Lomonosov collected 326 phosphorite nodules with a total weight of 1.109 kg from a depth of 210 m in the vicinity of Socotra Island in the Gulf of Aden. The morphological characteristics of the nodules and the conditions of their occurrence indicate that the nodules are products of erosion and redeposition of bedrock containing phosphorite nodules. The time of formation of the nodules has not bedn established; their removal and redeposition are continuing at the present time. The nodules are composed mainly of mixture of finely dispersed isotropic phosphate matter and fine crystalline calcite. The nodules contain quartz, chalcedony and apatite, less frequently pyroxene, feldspar, zircon and other minerals. The large amount of impurities, including 10 to 15% calcite, clay matter, iron oxides, and quartz, makes it impossible to determine the mineralogical form of the phosphate matter. Considering the active reaction of the nodules with hydrochloric acid, phosphate isotropy and easy solubility, and the presence of apatite, it is probable that the phosphorites consist of a multicomponent system, with predominance of the isotropic variety of carbonate-apatite - fluorapatite- collophane. (Knapp-USGS)
W71-12650

RADIOACTIVITY OF THREE FRESH-WATER MOLLUSCS OF THE TIDAL COLUMBIA RIVER AND THEIR ASSOCIATED SEDIMENTS,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 05C.
W71-12663

CHANGES IN COASTAL MORPHOLOGY OF MONOMOY ISLAND, CAPE COD, MASSACHUSETTS,
Geological Survey, Woods Hole, Mass.
R. N. Oldale, J. D. Friedman and R. S. Williams, Jr.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B101-B107, 1971. 4 fig, 6 ref.

Descriptors: *Beach erosion, *Geomorphology, *Sand spits, Sand bars, Surf, Sands, Aerial photography, Photogrammetry, Terrain analysis, Erosion, Ocean waves, Waves (Water), Massachusetts.
Identifiers: *Monomoy Island (Mass), Cape Cod (Mass).

Monomoy Island, an active spit undergoing short- and long-term changes in its coastline, projects southward from the elbow of Cape Cod. The 1969 shoreline was determined from cartographic aerial photography using Ektachrome Aero, Ektachrome infrared Aero, and Plus-X Aerographic films. Comparison of this shoreline with older shorelines, of as long ago as 1887, showed numerous changes in the configuration of the spit. The north end of the island has been receding since 1948. If retreat of the northern half of the Atlantic Ocean shore continues at the current rate of about 40 feet per year, the island may separate into two parts in 70 or 80 years. Eastward progradation of the southern half of the island has continued at a rate of about 40 feet per year since at least 1853. The present encroachment of the south end of Monomoy Island into two deep basins to the southeast and southwest may result in a major reducti the rate of southward progradation of the spit and may lead to increased erosion of the western shore. (Knapp-USGS)
W71-12669

MOVEMENT MEASUREMENTS ON TWO ROCK GLACIERS IN THE EASTERN ELK MOUNTAINS, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02C.
W71-12670

THERMAL INFRARED DETECTION OF GLACIAL GRAVEL, YELLOWSTONE NATIONAL PARK, WYOMING,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07B.
W71-12672

EFFECTS OF URBANIZATION ON SEDIMENT TRANSPORT IN BEL PRE CREEK BASIN, MARYLAND,
Geological Survey, College Park, Md.
For primary bibliographic entry see Field 04C.
W71-12674

RESISTANCE TO FLOW IN FLAT-BED SAND CHANNELS,
Geological Survey, Albuquerque, N Mex.
For primary bibliographic entry see Field 08B.
W71-12681

THE EAGLE VALLEY EVAPORITE, NORTHWEST COLORADO-A REGIONAL SYNTHESIS,
Geological Survey, Washington, D.C.
W. W. Mallory.
GPO, Washington, DC, 20402, Price $1.75. geological Survey Bulletin 1311-E, 1971. 37 p, 8 fig, 3 plate, 1 tab, 31 ref.

Descriptors: *Erosion, *Land forming, *Hydrogeology, *Petrography, *Colorado, Mineralogy, Geomorphology, Weathering, Surface runoff, Arid climates, Gypsum, Salts.
Identifiers: *Eagle Valley Evaporite (Colo), Lithology.

The Eagle Valley Evaporite of Northwest Colorado consists principally of gypsum and anhydrite, but contains an appreciable quantity of halite and traces of potash salts. The enclosing rocks are conglomerate, sandstone, siltstone, shale, and

limestone. The age of the formation is Middle Pennsylvanian, late Atoka, and Des Moines. The thickness of the evaporite interval ranges from 9,000 feet in the vicinity of Eagle, Colo., to zero at the northeastern edge of the Eagle basin, 25 miles away. In some areas flowage has increased original depositional thickness. Because of its pliability, the evaporite is deformed more than other rocks in its vicinity. It shows the effects of load metamorphism, Laramide tilting, diapiric upwelling, and contortion due to flowage and hydration of anhydrite. The evaporite was deposited in a landlocked marine trough between the Uncompahgre and Frontrange uplifts. Marine circulation and interchange of water were impeded on the open northwest end by a broad, shallow shelf, while exceptionally thick evaporite rocks were deposited at the distal, southeast end. The climate was arid or semiarid, with occastional torrential rain. Mineral commodities of possible future commercial value, contained in or associated with this formation, are gypsum, halite, salts of potassium, oil and gas. (Woodard-USGS)
W71-12783

NATURAL SLOPE FAILURE, NORTHEASTERN SKEENA MOUNTAINS,
Geological Survey of Canada, Vancouver (British Columbia).
G. H. Eisbacher.
Canadian Geotechnical Journal, Vol 8, No 3, p 384-390, August 1971. 6 fig, 13 ref.

Descriptors: *Landslides, *Hydrogeology, *Rockslides, *Structural geology, Aquifers, Groundwater movement, Mass wasting, Erosion, Slopes, Stratigraphy, Geology, Topography.
Identifiers: *British Columbia.

Twenty-five rockslides in sedimentary strata of the Skeena Mountains in north-central British Columbia are concentrated along a distinct belt approximately 30 km wide. Four slides belong to a 'shallow' type, 21 to a 'deep' slide type. Slopes oriented parallel to the structural trend and made up of heterogeneous conglomerate, sandstone, shale successions are more likely to fail than others. Water, rock anisotropy, and permeability variations have profound influence on rock slope failure. These three parameters are evaluated in a qualitative way for the slopes in the northeastern Skeena Mountains. The presence of highly permeable conglomerate lenses and beds interlayered with shale afford a means of building up artesian heads in the toe of many slopes and causing these to fail either by slow progressive decrepitation or, more rarely, by sudden failure. The conglomerates in the area are generally poorly cemented and occasionally fractured; higher permeability is assumed in the conglomerates. (Knapp-USGS)
W71-12803

SWELLING CLAY IN TWO SLOPE FAILURES AT TORONTO, CANADA,
University of Western Ontario, London. Dept. of Engineering Science.
For primary bibliographic entry see Field 02G.
W71-12804

SOUTH NATION RIVER LANDSLIDE, 16 MAY 1971,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
W. J. Eden, E. B. Fletcher, and R. J. Mitchell.
Canadian Geotechnical Journal, Vol 8, No 3, p 446-451, August 1971. 5 fig.

Descriptors: *Landslides, *Clays, *Quick clays, Water levels, Groundwater, Glacial drift, Mass wasting, Soil physical properties, Infiltration, Soil water, Snowmelt.
Identifiers: South Nation River (Ont).

During the night of May 16-17, 1971 a large land slide, involving nearly 70 acres, occurred along the South Nation River 4 miles north of the village of Casselman, Ontario, and about 30 miles east of Ottawa. The landslide occurred in 80-ft high clay slopes, left a scar about 2100 ft along the river bank, and extended 1600 ft back from the river. Debris from the landslide was carried both upstream and downstream from the slide, filling nearly 8000 ft of river bed to a depth that will raise the river level more than 36 ft before it overtops. The landslide occurred at the end of the snowmelting season. The winter of 1970-71 deposited an all-time record snowfall in the area, and melting was gradual, allowing the maximum amount of infiltration into the soil. Water was observed standing in the fields in the surrounding countryside at the time of the landslide. A surficial cover of banded silty, fine sand, generally 60 to 20 ft thick, overlies an extensive postglacial (Champlain Sea) deposit of marine clay. Beneath the marine clay is a deposit of silty till overlying limestone bedrock of the Ordovician-aged Ottawa Formation. (Knapp-USGS)
W71-12806

THE SAINT-JEAN-VIANNEY LANDSLIDE: OBSERVATIONS AND EYEWITNESSES ACCOUNTS,
Laval University, Quebec.
F. Tavenas, J. Y. Chagnon, and P. La Rochelle.
Canadian Geotechnical Journal, Vol 8, No 3, p 463-478, August 1971. 14 fig, 1 tab, 6 ref.

Descriptors: *Landslides, *Quick clays, *Clays, Glacial drift, Mass wasting, Soil physical properties, Leaching, Weathering, Infiltration, Soil water, Groundwater, Water levels.
Identifiers: *Saint-Jean-Vianney (Quebec).

A major landslide occurred in Champlain Clay at Saint-Jean-Vianney, Quebec, on May 4, 1971. Preliminary investigations reveal that the slide commenced about 10.15 p.m., hit the east section of the town about 10.55 p.m., and within 5 min carried 40 homes to destruction. An estimated 9 million cubic yards of material moved during the slide, from an area of approximately 350,000 square yards. The slide commenced within the crater of a much larger landslide that occurred about 500 years ago, and after completed liquefaction travelled down the Riviere aux Vases at a speed of approximately 16 miles/h, carring debris out into the middle of the Saguenay River. (Knapp-USGS)
W71-12807

TREND OF PRESENT-DAY EROSION-ACCUMULATION PROCESSES IN THE LOWER REACHES OF RIVERS IN THE WESTERN TRANSCAUCASUS,
A. F. Mandych, and R. S. Chalov.
Soviet Hydrology: Selected Papers, No 1, p 33-37, 1970. Translated from Vestnik Moskovskogo Universiteta (MGU), No 1, p 66-71, 1970.

Descriptors: *Sedimentation, *Erosion, *Geomorphology, Deltas, Flood plains, Geologic control, Land subsidence, Mountains, Rivers, Terraces (Geological).
Identifiers: USSR, Black Sea, Caucasus.

Negative tectonic movements (subsidence) predominate on the Black Sea coast of the Caucasus. Intense river entrenchment processes, controlled by the general patterns of formation of the longitudinal river profile in an uplifting relief, predominate in the mountain zone. For example, the rate of downcutting of the Mzymta River in the lateral ranges of the Caucasus is 5.5 cm per year. In addition, entrenchment processes take place in the lower reaches of some rivers (Khozhupse, Belaya, Gumista, Kelasuri, Madzhara, Dgamishi, Galidzga, Inguri, Supsa, Natanebi, Kintrishi, and Chakvis-Tskali) and accumulation in other rivers (Psou, Bzybi, Chernaya, Baklanovka, Kodori, Mokva, Okumi, Rioni, and Chorokhi). The intensity of these processes, their causes, and their morphological manifestations are very diversified. Most typical for rivers whose lower reaches become entrenched is the transformation of the levels of the high flood plain in the downstream direction into corresponding flood plain surfaces that merge in the coastal lowland with the new Black Sea marine terrace. (Knapp-USGS).
W71-12816

COMPUTATION OF THE DURATION OF SILTING OF THE UPPER POOLS OF LOW-PRESSURE HYDROELECTRIC POWER PLANTS,
Sredneaziatiskii Nauchno-Issledovatelskii Institut Irrigatsii, Tashkent (USSR).
V. A. Skryl'nikov.
Soviet Hydrology: Selected Papers, No 1, p 37-41, 1970. 2 fig, 4 ref. Translated from Izvestiya Akad Nauk Uzbekskoy SSR, Ser Tekh Nauk, No 1, p 50-54, 1970.

Descriptors: *Reservoir silting, *Sedimentation rates, Sedimentation, Deposition (Sediments), Sediment yield, Streamflow, Equations.
Identifiers: USSR.

A relationship is given for computing the silting volumes in the upper pools of low-pressure hydroelectric powerplants. This relationship does not require that the initial degree of clarification be determined in advance, and the silting of the upper pool can be computed with allowance for the periodicity of discharge fluctuations, since the silting volume is expressed as a function of the total inflow of sediments into the upper pool. (Knapp-usgs0.
W71-12817

A LABORATORY APPARATUS FOR MAINTAINING UNIFORM SUSPENSIONS OF FINE-GRAINED SEDIMENT,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
E. W. Schiemer, J. R. Schubel, and G. M. Schmidt.
Chesapeake Bay Institute Technical Report 70, Reference 71-4, Johns Hopkins University, July 1971. 9 p, 5 fig.

Descriptors: *Sedimentation, *Fish eggs, *Environmental effects, *Fish hatcheries, *Model studies, Testing, Test procedures, Suspended load, Particle size, Structural engineering.

An apparatus was constructed and tested for maintaining uniform suspensions of fine-grained sediment for laboratory experiments on the effects of suspended sediment on the development and hatching success of anadromous and semi-anadromous fish eggs. Fifteen gallon aquaria were used as testing tanks, and thirty gallon plastic barrel liners as feeder reservoirs. The agitators, both in the testing tanks and in the feeder reservoirs, utilize vertically reciprocating perforated plates driven by gearmoters. Each of the test tank agitators employ a single rectangular polypropylene plate. Two sets of parallel levers and pivots maintain the plate in the center of the tank, and amplify the crank motion to produce the required stroke. Choice of amplitude and frequency of the plate motion are dictated by the settling velocities of the particles being used and are achieved by appropriate linage and motor speed selection. (Woodard-USGS)
W71-12834

HYDROMORPHOLOGICAL INVESTIGATIONS OF FLOOD PLAIN AND CHANNEL PROCESSES (Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protsessov).
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12843

CHANNEL DYNAMICS OF MOUNTAIN RIVERS (Problemy ruslovoy dinamiki gornykh rek),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12848

RELATIONSHIP OF THE HORIZONTAL DEFORMATION RATE OF A RIVER CHANNEL TO THE RIVER DISCHARGE AND MORPHOLOGICAL REFORMING CYCLES (K voprosu o svyazi skorosti planovykh deformatsiy rechnogo rusla s vodnost'yu reki i tsiklami morfologicheskikh pereformirovaniy),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12849

ON-SITE INVESTIGATIONS OF THE MORPHOLOGY AND HYDRAULICS OF MEANDERS IN FREE MEANDERING (Naturnyye issledovaniya morfologii i gidravliki izluchin svobodnogo meandrirovaniya),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W71-12850

NONSCOURING VELOCITIES OF ASH DEPOSITS ON ASH DUMPS OF THERMAL ELECTRIC POWERPLANTS (O nerazmyvayushchikh skorostyakh zol'nykh otlozheniy na zolootvalakh teplovykh elecktricheskikb stantsiy),
State Hydrological Inst., Leningrad (USSR).
V. A. Melent'yev, and V. G. Panteleyev.
In: Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protsessov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 183, p 166-179, 1970. 3 fig, 1 tab, 14 ref.

Descriptors: *Sediments, *Sediment transport, *Sediment discharge, *Scour, *Thermal powerplants, Stream erosion, Bed load, Slopes, Flow rates, Flumes, Aggradation, Discharge (Water), Water temperature, Suspended load, Particle size, Bulk density, Peat, Coals.
Identifiers: *USSR, Nonscouring velocity, Ash deposits, Riffles, Slag.

In storing the ash-slag material discharged from thermal electric power stations it is often necessary to determine the scour conditions of the ash deposits formed in the area of ash dumps. To determine the average nonscouring velocities for ash deposits of varying size, studies were conducted in an experimental flume 16.75 m long and 0.6 m wide. A total of 16 ash materials, differing in particle-size composition and bulk density, were examined. The materials were derived from peat, Kuznetsk and Donets coals, and the washed ashes of these fuels. Formation of riffles, similar to those of sand and gravel materials, and a so-called dune-riffle regime of sediment movement were observed for these deposits during periods of nonscouring velocity. The height of the riffles was 2-3 mm and their spacing was 12-15 cm. The hydraulic values measured in the flow regime of the small riffles included: (1) the water discharge; (2) the depth of the flow; (3) the bed load and suspended sediment discharges; (4) the pulsating characteristics of flow; (5) the temperature of the water; and (6) the slope of the free water surface and that of the flume. Formulas were derived for calculating the average nonscouring velocities for ash deposits formed above and below the water surface. (See also W71-12843) (Josefson-USGS)
W71-12852

A WET SAND DOSIMETER FOR ADDING SEDIMENTS TO AN ERODIBLE MODEL (Dozimetr syrogo peska dlya podachi nanosov na razmyvayemuyu model'),
State Hydrological Inst., Leningrad (USSR).
Z. M. Velikanova, and N. A. Yarnykh.
In: Gidromorfologicheskiye issledovaniya poymennogo is ruslovogo protsessov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 183, p 202-204, 1970. 1 fig, 1 ref.

Descriptors: *Sediments, *Sands, *Model studies, *Sediment discharge, Hydraulic models, Meanders, Equipment, Foreign research.
Identifiers: *USSR, State Hydrologic Institute, Dosimeters, Erodible models.

A dosimeter designed by the Department of Channel Processes of the State Hydrologic Institute for adding wet sand to an erodible channel model is described. The dosimeter consists of a hopper with a capacity of 0.6 cu m of sand, a feed chamber, a 0.02 cu m mixing tank and a 50 cm-wide conveyor belt. The dosimeter was used on a model of a river meander. The sediment discharge varied between 10 and 260 g/sec. An addition of sand in 10-15 min intervals during low sediment discharge eliminated the need for full-time personnel. A large area of contact between the conveyor belt and the sand in the feed chamber ensured a uniform supply of sediments to the model. (See also W71-12843) (Josefson-USGS)
W71-12854

2K. Chemical Processes

TEMPERATURE, DISSOLVED OXYGEN AND SALINITY DATA FOR THE PENOBSCOT RIVER ESTUARY, 1966-1970.
Maine Univ., Orono, Cooperative Fishery Unit.
For primary bibliographic entry see Field 02L.
W71-12246

PROPERTIES OF TILE DRAINAGE WATER,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05B.
W71-12252

'POLYWATER': EVIDENCE FROM ELECTRON SPECTROSCOPY FOR CHEMICAL ANALYSIS (ESCA) OF A COMPLEX SALT MIXTURE,
Purdue Univ., West Lafayette, Ind. Dept. of Chemistry; Bell Telephone Labs, Murray Hill, N.J.; and Hewlett-Packard Co., Palo Alto, Calif.
For primary bibliographic entry see Field 10.
W71-12268

MINOR ELEMENTS IN WATER,
Geological Survey, Denver, Colo.
M. W. Skougstad.
Geological Society of America Memoir 123, p 43-55, 1971. 1 fig, 7 tab, 4 ref.

Descriptors: *Water quality, *Trace elements, *Spectroscopy, *Water analysis, Municipal water, Water treatment, Chemical analysis, Data collections, Water supply, Heavy metals, Aqueous solutions, Water chemistry.

A complete characterization of natural waters includes a determination of the concentrations of 30 or more minor elements. Emission spectrochemical methods are uniquely suited to the determination of a comparatively large number of minor elements, mainly those classified as heavy metals. Spectrochemical data have been available since 1935 and provide insight into the minor-element character of the raw- and finished-water supplies of most major U.S. cities. Such data permit assessment of those supplies that contain either comparatively high or low concentrations of minor elements. The concentrations of many minor elements are unchanged by the municipal treatment-plant operations between the raw- and finished-water supply. However, part of the copper in a raw-water supply may be removed during treatment, even though the over-all result is a net increase in copper in the finished water. The aluminum concentration of finished water is greater than in the raw-water supply when aluminum sulfate is used as a coagulant aid. Significant amounts of iron may be removed during treatment. (Knapp-USGS)
W71-12269

WATER,
University of East Anglia, Norwich (England).
C. Hall.
Chemistry, Vol 44, No 8, p 6-10, September 1971. 4 fig, 9 ref.

Descriptors: *Water, *Water properties, *Water chemistry, *Water structure, *Water types, Chemical properties, Water vapor, Ice, Silica, Gels.
Identifiers: *Polywater.

The chemical and physical characteristics of water in its liquid, gas and solid forms are discussed and illustrated. The properties of polywater (anomalous water) are discussed. Commonplace though water may be, its properties are of the greatest importance in the operation of living processes. Water was present on Earth before life originated, and was probably the medium from which life emerged. If and when life is found elsewhere in the universe, if it makes use of water, it will have many similarities with the life we know, and if it does not, it will be extremely different. (Woodard-USGS)
W71-12270

BROMIDE GEOCHEMISTRY OF SALT ROCKS,
Chevron Research Co., La Habra, Calif.
William T. Holser.
In: Second Symposium on Salt, Volume 1, May 3-5, 1965, Clevelend; Northern Ohio Geological Society, Inc, p 248-275, 1966. 28 p, 20 fig, 2 tab, 57 ref.

Descriptors: *Sodium chloride, *Salts, *Halides, *Tidal marshes, *Playas, Sea water, Saline water, Saline lakes, Lake basins, Shallow water, Standing waters, Saline water systems, Hot springs, Magnetic water, Alkaline water, Sedimentary rocks, Inorganic compounds, Deserts, Evaporation, Runoff, Water levels.
Identifiers: *Bromine, Weeks Island (Louisiana), Permiam-Delaware Basin (Texas), Laguna Ojo de Liebre (Baja California).

Investigations begun in 1959 on the distribution of bromide in some domestic salt deposits indicate that halite containing large concentrations of bromide possibly resulted from volcanic and hot spring activity. Modern sea water deposits contain lesser amounts of this substance. The author presents an informative and detailed review of the general geochemistry of bromide that includes bromide studies made on some specific evaporite basins in the U.S. and Canada. (Glasby-USGS)
W71-12271

NATURAL HYDROTHERMAL SYSTEMS AND EXPERIMENTAL HOT WATER/ROCK INTERACTIONS (PART II),
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
A. J. Ellis, and W. A. J. Mahon.
Geochimica et Cosmochimica Acta, Vol 31, No 4, p 465-490, April 1967. 25 p, 7 fig, 7 tab, 17 ref, append.

Descriptors: *Aqueous solutions, *Thermal water, *Petrology, *Mineralogy, *Igneous rocks, Lava, Water chemistry, Silicates, Rock properties, Chemical analysis, Chemical properties, Geochemistry, Analytical techniques, Thermal properties, Water properties, Solutes, Solubility, Ion exchange, Inorganic compounds.
Identifiers: Wellington (New Zeal), *Taupo Volcanic Zone (New Zeal), Lake Taupo (New Zeal).

Volcanic rocks from the Taupo Volcanic Zone northeast of Wellington, New Zealand were heated in the presence of water to 400, 450, 500 and 600 degrees C, at pressures of 1000 to 1500 bars. All rock samples tested were reduced to grain size of 1-5 mm, and were placed in removable platinum liners inserted and sealed in pressure vessels. Each vessel was heated dry in an electric tube-furnace until thermal equilibrium was attained, at which time water was injected. Water injection ceased when pressure reached 1500 bars. Runs of 14 days duration for each sample at temperatures of 400, 450, 500 and 600 degrees C followed. At the end of each test all vessels were quickly cooled and the pH taken. Most solutes are controlled in concentration by mineral solubility and ion exchange. Acidity increased along with temperature increase. Some of

the major constituents of natural hot waters (chloride, boron, ammonia and fluoride) were dissolved during rock alteration. Lack of hydrothermal alteration indicates that a fairly high percentage of those soluble components present were contained in the intergranular surfaces of these specimens. (Glasby-USGS)
W71-12284

GAS CHROMATOGRAPHIC MEASUREMENTS OF HYDROTHERMAL EMANATIONS AT YELLOWSTONE NATIONAL PARK,
Arkansas Univ., Fayetteville. Dept. of Chemistry.
B. D. Gunter, and B. C. Musgrave.
Geochimica et Cosmochimica Acta, Vol 30, No 11, p 1175-1189, November 1966. 15 p, 5 fig, 3 tab, 15 ref.

Descriptors: *Wyoming, *Hot Springs, *Geysers, *Mineral water, *Subsurface waters, Thermal water, Heated water, Water vapor, Water properties, Confined water, Water chemistry, Magmatic water, Percolating water, Groundwater movement, Inorganic compounds, Radioactivity, Silica, Chemical analysis, Gas chromatography, Water analysis, Thermal properties, Gases, Steam.
Identifiers: *Yellowstone National Park, *Hydrothermal gases, *Hydrothermal features.

Samples of gases of hydrothermal origin from over 100 selected hot springs in Yellowstone National Park were studied and analyzed for chemical composition and origin. This investigation was part of a general survey of the park designed to locate sites for future isotopic analysis. As thermal activity in the area is unevenly distributed, sites had to be selected that were in many cases widely scattered. Gases were analyzed by gas chromatography. Of the 9 gases investigated, only carbon dioxide, hydrogen oxygen, argon, nitrogen, and methane were quantitatively identified. This information will eventually be used in determining possible sources and origins of these gases. The non-reactive gases were treated by a Rayleigh distillation process, which gives a strong correlation between argon and all of the other non-reactive gases, although the correlation with helium is not as well defined as for the other gases. This correlation indicates a predominatly atmospheric origin for these gases. (Glasby-USGS)
W71-12285

AN INVENTORY AND STUDY OF BEAVER IMPOUNDED WATER IN MISSISSIPPI,
Mississippi State Univ., State College. Dept. of Wildlife Management.
For primary bibliographic entry see Field 02H.
W71-12286

CHAPTER 1. CHEMICAL, PHYSICAL, AND BIOLOGICAL CHARACTERISTICS OF WATER RESOURCES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02A.
W71-12348

POTOMAC RIVER WATER QUALITY NETWORK, WATER YEAR 1970.
Interstate Commission on the Potomac River Basin, Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-12363

EFFECT OF WATERLOGGING AND ORGANIC MATTER ON THE LOSS OF APPLIED SULFUR,
California Univ., Hopland. Hopland Field Station.
For primary bibliographic entry see Field 02G.
W71-12377

A STATISTICAL COMPARISON OF pH VALUES OF SOME ENGLISH SOILS AFTER MEASUREMENT IN BOTH WATER AND 0.01M CALCIUM CHLORIDE,
Cincinnati Univ., Ohio. Dept. of Geography.
For primary bibliographic entry see Field 02G.
W71-12378

DEMISING OF EXCHANGEABLE CATIONS IN FREE-SWELLING BENTONITE CLAY,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 02G.
W71-12379

DIFFERENTIAL Sr-Ca BONDING ON SOIL AS INFLUENCED BY BONDING SITE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W71-12381

REACTION OF COPPER TETRAMMINE WITH BENTONITE CLAY,
California Univ., Berkeley. Space Sciences Lab.
For primary bibliographic entry see Field 02G.
W71-12382

CHEMICAL CHARACTERISTICS OF THE COPPICE DUNE SOILS IN PARADISE VALLEY, NEVADA,
Agricultural Research Service, Reno, Nev. Soil and Water Conservation Div.
For primary bibliographic entry see Field 02G.
W71-12383

HYDROCHEMISTRY OF THE COAST OF EAST ANTARCTICA (PRAVDA COAST AREA), COMMUNICATION 1,
Gidrokhimicheskii Institut, Novocherkassk (USSR).
For primary bibliographic entry see Field 02C.
W71-12400

HYDROCHEMISTRY OF THE COAST OF EAST ANTARCTICA (PRAVDA COAST AREA), COMMUNICATION 2. VARIATIONS IN THE CHEMICAL COMPOSITION OF PRECIPITATION,
Gidrokhimicheskii Institut, Novocherkassk (USSR).
For primary bibliographic entry see Field 02C.
W71-12401

ROLE OF EVAPORATION IN THE MIGRATION OF SALTS INTO THE ATMOSPHERE,
Severo-Osetinskii Selskokhozyaistvenni Institut, Ordzhonikidze (USSR).
For primary bibliographic entry see Field 02D.
W71-12402

COMPUTATION OF RIVER WATER MINERALIZATION DURING FORECASTING BY MEANS OF A 'NAIRI' ELECTRONIC COMPUTER,
Rostov-onDon State Univ., USSR.
For primary bibliographic entry see Field 07C.
W71-12403

FACTORS AFFECTING WATER QUALITY OF SMALL MOUNTAIN CATCHMENTS,
Swiss Forest Research Inst., Birmensdorf (Switzerland).
H. M. Keller.
In: Wellington Symposium - The Results of Research on Representative and Experimental Basins; December 1-8, 1970, New Zealand: New Zealand Journal of Hydrology, Vol 9, No 2, p 133-141, 1970. 9 p, 1 fig, 4 tab, 11 ref.

Descriptors: *Water quality, *Water chemistry, *Small watersheds, Leaching, Weathering, Climates, Geochemistry, Topography, Vegetation effects, Hardness (Water), Calcium, Carbonates, Sodium, Discharge (Water), Water temperature.
Identifiers: *Switzerland, *Experimental watersheds.

Five small catchments in the north-eastern Prealps of Switzerland were investigated for variations of stream water chemistry during the years 1967 and 1968 using the stepwise multiple-regression technique. Concentrations of magnesium, potassium, silica, sulphate, chloride, nitrate, ammonium and pH value show little variation. Measurements of electrical conductivity, total hardness, and calcium, carbonate, and sodium concentrations indicate considerable variation. Discharge rate is found to account in three of the five streams for 80% or more of the variation of the five chemical components. However, the compound effect of discharge, water temperature and a factor estimating seasonal change of soil moisture conditions accounts in all five catchments for 71% to 95% of the variation. Differences between streams seem to be due to differences in vegetation cover and soil conditions of the respective catchments. (Knapp-USGS)
W71-12425

DESCRIPTION AND FORMATION OF THE CHEMICAL COMPOSITION OF ATMOSPHERIC WATERS AND WATERS OF ARID REGIONS. METHODS OF STUDY (Kharakteristika i formirovaniye khimicheskogo sostaya atmosfernykh vod i vod sushi. Metody ikh izucheniya).
Gidrokhimicheskii Institut, Novocherkassk (USSR).

Gidrokhimicheskiye Materialy, Vol 54, 1970. 132 p.

Descriptors: *Water chemistry, *Water analysis, *Chemical analysis, *Analytical techniques, *Water properties, Water types, Electrochemistry, Geochemistry, Thermodynamics, Water quality, Chemical precipitation, Aqueous solutions, Ion exchange, Chemical reactions, Equilibrium, Oxidation, Trace elements, Organic matter, Salts, Oxidation-reduction potential.
Identifiers: *USSR, *Natural waters, *River waters, *Mineralization, Sorbents, Zonality, Chromaticity, Biogenous substances, Zinc, Silver.

This issue of the Hydrochemical Materials consists of 16 pages devoted to a study of the chemical composition of natural waters of the USSR. Various aspects of water chemistry are examined. These include: (1) the calcium carbonate equilibrium of mineral waters; (2) the oxidation capacity of river waters; (3) the physicochemical properties of solutions formed during interaction of water with rocks; (4) the regime of biogenous and organic substances in reservoir waters; (5) the oxidation-reduction properties of solutions in contact with igneous and metamorphic rocks; (6) the role of sorbents in determining calcium sulfate solubility; (7) the surface exchange of natural sorbents in a water medium; and (8) spectrographic and photometric determinations of trace elements in various water samples. This collection of papers is intended for use by chemical hydrologists, geochemists, hydrogeologists, geologists and other specialists interested in the results of chemical analyses of natural water. (See also W71-12435 thru W71-12448) (Josefson-USGS)
W71-12434

CALCIUM CARBONATE EQUILIBRIUM OF VARIOUS MINERAL WATERS OF EASTERN SAYAN (Karbonatno-kal'tsiyevoye ravnovesiye nekotorykh mineral'nykh vod Vostochnogo Sayana),
Irkutskii Gosudarstvennyi Universitet (USSR).
V. M. Levchenko, G. M. Shpeyzer, and N. A. Selina.
In: Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i vod sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 3-7, 1970. 2 tab, 15 ref.

Descriptors: *Water types, *Calcium carbonate, *Mineral water, *Equilibrium, *Water chemistry, Chemical analysis, Thermal water, Aqueous solutions, Saturation, Thermal springs, Chemical precipitation, Water temperature, Nitrogen,

Methane, Gases, Carbon dioxide, Bicarbonates, Sulfates.
Identifiers: *USSR, Siberia, Sayan Mountains, Mineral springs, Carbonate water, Mineralization, Sulfate water.

The calcium-carbonate equilibrium of various mineral springs of Eastern Sayan was examined in connection with determining the degree of calcium carbonate saturation of these waters. The waters examined were divided into three groups according to their gas composition: (1) nitric (cold and thermal); (2) carbonate (cold and thermal); and (3) methane (thermal). Cold carbonate waters of the bicarbonate class are relatively stable supersaturated systems. Solutions of thermal carbonate waters are unstable even at low degree of saturation and lead to carbonate precipitation. The nitric thermal springs of Nilova Pustyn' belong to the class of sulfate waters and are nonsaturated by calcium carbonate. (See also W71-12434) (Josefson-USGS)
W71-12435

DESCRIPTION OF MINERAL WATERS OF THE ZAKARPATSKAYA OBLAST BASED ON THEIR IONIC AND GAS COMPOSITIONS (K-harakteristika mineral'nykh vod Zakarpatskoy oblasti po ionnomu i gazovomu sostavu),
Politekhnicheskii Institut, Novocherkassk (USSR).
V. M. Levchenko, and F. V. Lapshin.
In: Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i vod sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 8-13, 1970. 1 fig, 1 tab, 6 ref.

Descriptors: *Water chemistry, *Water types, *Water quality, *Mineral water, *Salts, Springs, Gases, Ions, Carbon dioxide, Methane, Nitrogen, Bicarbonates, Sulfates, Chlorides, Water analysis, Hydrogen sulfide.
Identifiers: *USSR, *Ukraine, Zakarpatskaya, Oblast, Carpathian Ruthenia, Mineralization, Mineral springs.

A relationship was established between the gas and ionic compositions of various types of mineral waters of the Zakarpatskaya Oblast (Carpathian Ruthenia). Based on a study of 86 mineral springs, the following types of water were distinguished: bicarbonate, sulfate, chloride, bicarbonate-sulfate, bicarbonate-chloride, and sulfate-chloride. Bicarbonate waters are characterized by a predominance of CO2, which, in most of the springs examined, amounted to more than 50%. The composition of sulfate waters is 60% N2, 21% H2S, 15% CO2 and 3% CH4. Methane is predominant in the gas composition of chloride waters; in 16 of 23 samples studied the CH4 content was 80-99.5% and only in 3 samples was it less than 60%. Bicarbonate-sulfate waters, which are rarely found in the Zakarpatskaya Oblast, contain very high amounts of CO2 (99.2%) and only negligible amounts of N2 (0.8%). Bicarbonate-chloride waters contain amounts of CO2 and CH4 typical of those found in bicarbonate and chloride waters, respectively. The composition of sulfate-chloride waters is more than 70% CO2, about 20% N2 and less than 3% CH4; the N2 content in these waters is similar to that in sulfate waters and the CH4 content approximates that found in chloride waters. (See also W71-12434) (Josefson-USGS)
W71-12436

CLASSIFICATION OF MINERAL WATERS OF THE UKRAINIAN CARPATHIANS (Klassifikatsiya mineral'nykh vod Ukrainskikh Karpat),
Gosudarstyennyi Meditsinskii Institut, Chernovtsy (USSR).
V. M. Levchenko, and F. V. Lapshin.
In: Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i vod sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 14-18, 1970. 1 tab, 5 ref.

Descriptors: *Water chemistry, *Classification, *Mineral water, *Water types, *Water analysis, Salts, Groundwater, Springs, Ions, Gases, Brackish water, Saline water, Bicarbonates, Sulfates, Chlorides, Sodium sulfate, Calcium sulfate, Sodium chloride, Calcium chloride.
Identifiers: *USSR, Ukraine, Carpathian Mountains, Zakarpatskaya Oblast, Chernovtsy Oblast, Ternopol' Oblast, Sodium carbonates, Glauber's salt, Natural waters, Balneology.

Mineral waters of more than 200 springs in the Ukrainian Carpathians, including the Zakarpatskaya, Chernovtsy and Ternopol' Oblasts, were examined for developing a chemical classification of mineral waters based on specific ratios of predominant ions and dissolved gases. All mineral waters under consideration were divided into six classes: bicarbonate, sulfate, chloride, bicarbonate-sulfate, bicarbonate-chloride and sulfate-chloride. Bicarbonates, sulfates and chlorides are found in metamorphosed groundwaters and consist of sodium carbonates, calcium-sodium sulfates (Glauber's salt) and calcium-sodium chlorides. Bicarbonate-sulfates, bicarbonate-chlorides and sulfate-chlorides represent more complex combinations and are found in waters of exposed and semi-exposed mountain structures, sulfate-free brackish waters and saline waters, respectively. The classification scheme proposed is preferred to other balneological classifications because of its small number of taxonomic units and mathematical simplicity. (See also W71-12434) (Josefson-USGS)
W71-12437

A HYDROCHEMICAL MAP OF THE OXIDATION CAPACITY OF RIVER WATERS OF THE EUROPEAN USSR AND CAUCASUS (Gidrokhimicheskaya karta okislyayemosti rechnykh vod Yevropeyskoy chasti SSSR i Kavkaza),
Gidrokhimicheskii Institut, Novocherkassk (USSR).
M. P. Smirnov, and M. N. Tarasov.
In: Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i vod sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 19-33, 1970. 1 map, 2 tab, 17 ref.

Descriptors: *Water chemistry, *Water analysis, *Oxidation, *Rivers, *Organic matter, Oragnic acids, Sampling, Water zoning, Soils, Topography, Biomass, Grasslands, Mixed forests, Deserts, Vegetation, Tundra, Orography, Color, Mapping, Distribution patterns.
Identifiers: *European USSR, *Caucasus, Carpathians, Crimea, Zonality, Permanganates, Bichromates, Taiga, Mineralization, Chromaticity.

The results of a determination of the permanganate oxidation capacity of approximately 21,000 water samples collected from 2,300 points in the European USSR and Caucasus between 1936 and 1966 were examined for preparing a 1: 7,500,000 scale map of the oxidation capacity of river waters. The content and composition of the organic matter of the waters and its territorial distributoion were determined by latitudinal and vertical zonality and by topography. A hydrochemical zone of high oxidation (15-20 mg O/liter) was typical of the geographic zones of the northern and middle taiga; a zone of moderately high oxidation (10-15 mg O/liter) was observed in the southern taiga and mixed forest zones; a hydrochemical zone of moderate oxidation (5-10 mg O/liter) corresponded generally to the zones of broad-leaved forests, forest steepes, steepes, semideserts, deserts, and tundras. Vertical zonality is the most important pattern observed in the geographical distribution of organic matter in mountain rivers. Between two and three vertical hydrochemical zones of oxidation were distinguished in the Caucasus, Crimea and Carpathians. Vertical zonality was most developed in the Caucasus where 3 zones of oxidation were identified: a zone of very low oxidation (0-2 mg O/liter); a zone of low oxidation (2-5 mg O/liter); and a zone of moderate oxidation (5-10 mg O/liter). The qualitative composition of the organic matter of river waters varied according to geographic zones. In the European USSR the ratios of permanganate oxidation to bichromate oxidation decreased in a southerly and south-easterly direction from 50 to 35-40%. A simultaneous decrease in the chromaticity of the waters attested to a reduction in this direction in the amount of readily-oxidizable and colored organic substances. (See also W71-12434) (Josefson-USGS)
W71-12438

REGIME OF BIOGENOUS AND ORGANIC SUBSTANCES IN VARIOUS RESERVOIRS OF THE KRASNODAR KRAY (O rezhime biogennykh i organicheskikh veshchestv v nekotorykh vodokhranilishcharkh Krasnodarskogo kraya),
Gidrokhimicheskii Institut, Novocherkassk (USSR).
For primary bibliographic entry see Field 05B.
W71-12440

USE OF THE GRAPHO-ANALYTICAL METHOD TO STUDY THE ORIGIN OF NATURAL WATERS (BASED ON MATSESTA WATER) (Primeneniye grafo-analiticheskogo metoda dlya issledovaniya genezisa prirodnykh vod na primere Matsesty),
Politekhnicheskii Institut, Leningrad (USSR).
V. P. Shishokin.
In: Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i vod sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 53-58, 1970. 5 fig, 2 tab.

Descriptors: *Water chemistry, *Water analysis, *Mineral water, Biochemistry, Hydrogen, Sulfide, Magnesium, Calcium, Sulfur bacteria, Sodium, Potassium.
Identifiers: *USSR, Black Sea, Natural waters, Metamorphosed water.

The grapho-analytical method was recommended for studying the origin of natural waters. The method is based on a study of Matsesta hydrogen sulfide waters and of metamorphosed water of the Black Sea. A grapho-analytical expression of the relationship between the concentrations of the components (expressed in meq) in Metsesta water attests to its possible formation by sulfate reduction of Black Sea water. (See also W71-12434) (Josefson-USGS)
W71-12441

USE OF STATISTICAL METHODS TO VALIDATE HYDROCHEMICAL RESULTS (Ispol'zovaniye metodov matematicheskoy statistiki pri obosnovanii gidrokhimicheskikh vyvodov),
Uralskoe Geologicheskoe Upravlenie, Sverdlovsk (USSR).
A. I. Gavrishin.
In: Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i vod sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 59-67, 1970. 6 tab, 8 ref.

Descriptors: *Water chemistry, *Water analysis, *Model studies, *Statistical methods, Statistics, Sampling, Mathematical studies, Probability, Correlation analysis, Data processing, Reliability, Standards.
Identifiers: *USSR, Sverdlovsk Oblast, Natural waters, Autocorrelation, Coefficient of asymmetry, Probability models, Correlation coefficient.

The chemical composition of natural waters in the western part of the Karpinsk region of the Sverdlovsk Oblast was studied for applying statistical criteria to a quantitative validation of hydrochemical results. An independent random variable may be used as a probability model provided (1) mathematical expectation and dispersion of the distribution of the component in the chemical composition of the waters within the zone studied are constant; (2) there is no significant autocorrelation between the contents of the component in space; and (3) measurements of the contents of the component within the zone examined are equally precise. The optimal number of hydrochemical samples needed to establish significant differences in the distribu-

tion of hydrochemical parameters can be programmed in validating a model of an independent and equally precise random variable. The use of statistical criteria made it possible to determine the leading factors in the formation of the chemical composition of the natural waters of the area, to identify and map homogeneous hydrochemical parameters, to compare them quantitatively, and to study the interrelationships of the components. (See also W71-12434) (Josefson-USGS)
W71-12442

ROLE OF A SORBENT IN DETERMINING THE SOLUBILITY OF CALCIUM SULFATE IN NATURAL WATERS (Rol' sorbenta pri opredelenii rastvorimosti sul'fata kal'tsiya v prirodnykh vodakh),
Politekhnicheskii Institut, Novocherkassk (USSR).
V. M. Levchenko, M. B. Minkin, and T. P. Dukhnina.
In: Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i vod sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 77-80, 1970. 1 tab, 9 ref.

Descriptors: *Water chemistry, *Cation exchange, *Solubility, *Calcium sulfate, Water analysis, Montmorillonite, Gypsum, Ion exchange, Aqueous solutions, Equilibrium, Membranes, Electrodes, Ions, Chemical reactions, Equations, Theoretical analysis.
Identifiers: *USSR, Sorbents, Natural waters, Cation exchanger, Cation-exchange resin, Anhydride.

A study was made of the effect of montmorillonite, a natural cation exchanger, on the solubility of gypsum. The solubility of gypsum was examined in the calcium sulfate-water-montmorillonite system and was determined both empirically and by theoretical analysis. Inasmuch as the two-methods yielded comparable results, an equation was recommended for determining the amount of montmorillonite needed to dissolve a specific weighed quantity of gypsum. The solubility of gypsum in natural waters depended upon two factors: (1) the ionic strength of the solution and (2) the character of the ion-exchange equilibrium in the calcium sulfate-sorbent system. (See also W71-12434) (Josefson-USGS)
W71-12443

SURFACE EXCHANGE OF VARIOUS NATURAL SORBENTS IN A WATER MEDIUM (Poverkhnostnyy obmen nekotorykh prirodnykh sorbentov v vodnoy srede),
Politekhnicheskii Institut, Novocherkassk (USSR).
V. M. Levchenko, and M. B. Minkin.
In: Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i vod sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 81-86, 1970. 2 tab, 11 ref.

Descriptors: *Water chemistry, *Ion exchange, *Water analysis, *Electrochemistry, *Chemical analysis, Chemical reactions, Metals, Adsorption, Absorption, Ions, Aqueous solutions, Zeta potential, Sodium, Magnesium, Calcium, Chernozems, Mud, Montmorillonite, Soil properties.
Identifiers: *USSR, Rostov Oblast, Tarasovka Rayon, Manych Lake, Sorbents, Hydromica.

The degree of dissociation of different natural sorbents saturated by sodium, magnesium or calcium was examined. The sorbents selected for study were a clay loam Southern Chernozem (Tarasovka Rayon, Rostov Oblast), mud (Manych lake), montmorillonite, and hydromica. Measurements of electromotive force were conducted on a PPTV-1 potentiometer with an accuracy correct to within 0.1 mv. The degree of dissociation of the various sorbents in a water extract of a 17% suspension depended to a great extent on the character of the sorbent and the saturating ion. The degree of dissociation for Chernozem, mud, montmorillonite, and hydromica saturated by sodium was 12.6-18.4%; the degree of dissociation for the same sorbents saturated by magnesium or calcium was 0.6-1.8%. The zeta potential in each of the sorbents studied increased sharply during saturation by sodium. The degree of dissociation of the sorbents increased with dilution of the suspension and with a decrease in the Na/Ca ratio in the absorbing complex. The chemical composition of the natural waters was largely determined by the ratio of the adsorbed cations and by the concentration of the suspension. (See also W71-12434) (Josefson-USGS)
W71-12444

A SPECTROGRAPHIC DETERMINATION OF Ni, Co, Ag, V, Sn, Mo, Ti, Al, Bi, Fe, Pb and Mn IN NATURAL WATERS WITH HIGH COPPER CONTENT (Spektrograficheskoye opredeleniye Ni, Co, Ag, V, Sn, Mo, Ti, Al, Bi, Fe, Pb, Mn v prirodnykh vodakh pri povyshennykh kontsentratsiyakh medi),
Gidrokhimicheskii Institut, Novocherkassk (USSR).
V. Ya. Yeremenko, and Ye. A. Mel'nikov.
In: Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 87-90, 1970. 3 tab, 3 ref.

Descriptors: *Water chemistry, *Chemical analysis, *Spectroscopy, *Heavy metals, *Water analysis, Inorganic compounds, Analytical techniques, Trace elements, Copper, Cobalt, Molybdenum, Titanium, Aluminum, Iron, Manganese.
Identifiers: *USSR, *Natural waters, Don River, Silver, Nickel, Tin, Vanadium, Bismuth, Lead.

Spectrographic determinations were made of 12 heavy metals in natural waters of the Don River with varying high amounts of copper added. The metals examined were Ni, Co, Ag, V, Sn, Mo, Ti, Al, Bi, Fe, Pb, and Mn. When the copper content in the water sample was 60 micrograms the spectrographic determination error for all metals in the natural waters did not exceed plus or minus 20%. This is the maximum permissible error in spectrographic determination of trace elements in natural waters. The same determination accuracy was obtained for all the metals, except silver, when the copper content in the sample was increased to 80 micrograms. A procedure, developed by the Hydrochemical Institute of Novocherkassk, based on preliminary reduction of the copper concentration in a water sample, made it possible to maintain the specified limit of accuracy for all the metals except silver and tin when the copper content in the sample was increased to 1 mg. (See also W-71-12434) (Josefson-USGS)
W71-12445

STUDY OF THE FORMS OF LONG-LIVED RADIONUCLIDES IN WATER OF THE DON RIVER (Ob izuchenii form nakhozhdeniya dolgozhivushchikh radionuklidov v vode r. Dona),
Gidrokhimicheskii Institut, Novocherkassk (USSR).
V. B. Stradomskiy.
In: Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i vod sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 91-94, 1970. 1 tab, 13 ref.

Descriptors: *Water chemistry, *Radioisotopes, *Radiochemical analysis, *Water analysis, *Ion exchange, Cation exchange, Anion exchange, Radioactivity, Electrochemistry, Cesium, Strontium radioisotopes, Fallout.
Identifiers: *USSR, Don River, Cerium, Natural waters, River waters, Nonionic constituents, Ion-exchange resins.

The first results of a study of the cation, anion and nonionic forms of radionuclides Sr-90, Cs-137 and Ce-144, present in the natural waters of the Don River as a result of worldwide radioactive fallout, are described. The cation form is predominant in all three isotopes, representing 91-97% in Sr-90, 50-70% in Cs-137 and 50-60% in Ce-144. The content of the anion forms of Cs-137 and Ce-144 in the river water is 6-22% and 30-40%, respectively; the nonionic forms of Cs-137 and Ce-144 are 8-42% and 10-13%. Contrary to what might be expected, particularly in the case of Ce-144, the content of the anion and nonionic forms in the river water is considerably less than that of the cation form. (See also W71-12434) (Josefson-USGS)
W71-12446

PERMISSIBLE LIMITS OF VARIABILITY BETWEEN THE SUM OF SODIUM AND POTASSIUM IONS DERIVED EMPIRICALLY AND BY DIRECT DETERMINATION DURING CHEMICAL ANALYSIS OF WATER (O dopustimykh predelakh raskhozhdeniya mezhdu summoy ionov natriya i kaliya, poluchennoy raschetnym putem i pryamym opredeleniyem ikh pri khimicheskom analize vody),
Gidrohimicheskii Institut, Novocherkassk (USSR).
V. I. Koreneva, and G. S. Konovalov.
In: Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i vod sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 95-104, 1970. 12 fig, 2 tab, 15 ref.

Descriptors: *Water analysis, *Water chemistry, *Chemical analysis, *Variability, Correlation analysis, Flame photometry, Ions, Sodium, Potassium, Histograms, Statistical methods, Theoretical analysis.
Identifiers: *USSR, Mineralization, Natural waters, Distribution curves, Variation coefficient.

The content of sodium and potassium ions is usually not determined directly in a chemical analysis of natural waters but is calculated by difference between the sums of the anions and cations expressed in meq. A direct determination of sodium and potassium ions in natural waters by flame photometry makes it possible to obtain actual data on the content of these elements and to evaluate the accuracy of determining other predominant ions. More than 1,000 water samples were statistically analyzed to determine the permissible limits of variability between the total sodium and potassium in river waters of varying salinity, sodium content and potassium content. A graphic relationship was established between the empirically derived and directly determined sum of sodium and potassium; the graph may be used for rapid evaluation of the accuracy of water analyses in determining variability between sums of sodium and potassium, derived empirically and directly, for actual values of total mineralization and total sodium and potassium content. (See also W71-12434) (Josefson-USGS)
W71-12447

A PHOTOMETRIC DETERMINATION OF B, Mo, Mn, Cu and Zn IN WATER OF FERTILIZED FISH PONDS (Fotometricheskoye opredeleniye B, Mo, Mn, Cu i Zn v vode udobryayemykh rybovodnykh prudov),
Vsesoyuznyy Nauchno-Issledovatelskii Institut Prudovogo Rybnogo Khozyaistva, Moscow (USSR).
V. F. Ushakova.
In: Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i vod sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 110-118, 1970. 4 tab, 19 ref.

Descriptors: *Water chemistry, *Water analysis, *Trace elements, *Photometry, Chemical analysis, Aqueous solutions, Analytical techniques, Ponds, Fish farming, Evaporation, Drying, Fertilization, Organic matter, Copper, Boron, Molybdenum, Manganese.
Identifiers: *USSR, Pond water, Zinc, Reagents, Natural waters.

Application of organic and mineral fertilizers to ponds during intensive fish farming intensifies the development of the biochemical processes in the pond and increases sharply the content of various soluble organic substances, which interfere with the determination of trace elements in the water. To remove the influence of these substances a

photometric determination was made of B, Mo, Mn, Cu and Zn in the water of fertilized fish ponds which contained large amounts of soluble organic matter. Evaporation of the pond water samples and ignition of the dry residues in a muffle furnace at 450-500 deg C for 10-12 min made it possible to determine manganese, copper and zinc in 0.2 liters of pond water, boron in 0.5 liters of pond water and molybdenum in 1.0 liter of pond water. The use of highly sensitive reagents during analysis permitted determination of boron, molybdenum and manganese to be made correct to within 0.01, 0.02 and 1.0 micrograms per liter of water, respectively, and determinations of copper and zinc to be made to within 0.2 micrograms per liter. (See also W71-12434) (Josefson-USGS)
W71-12448

ION PAIRING AND WATER QUALITY MEASUREMENTS,
Waterloo Univ. (Ontario). Environmental Fluid Mechanics Lab.
For primary bibliographic entry see Field 05A.
W71-12465

CLUSTERING OF SULFUR DIOXIDE AND WATER VAPOR ABOUT OXONIUM AND NITRIC OXIDE IONS,
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 01B.
W71-12475

MICROFLORA OF THE THERMAL SPRINGS IN NIAKA BANJA, (IN SERBO CROATIAN),
N.A.
For primary bibliographic entry see Field 02I.
W71-12491

ON THE CHEMICAL COMPOSITION OF BOTTOM SEDIMENTS FROM LAKE SHINKI AND LAKE NAKA-UMI, WEST JAPAN: (STUDIES ON THE CHEMICAL COMPOSITION OF SEDIMENTARY ROCKS, 2ND REPORT) (IN JAPANESE),
For primary bibliographic entry see Field 02H.
W71-12505

THE WATER CHEMISTRY AND PESTICIDE LEVELS OF UTAH LAKE,
Brigham Young Univ., Provo, Utah. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W71-12585

A GEOCHEMICAL HYPOTHESIS FOR DOLOMITIZATION BY GROUND WATER,
Geological Survey, Washington, D.C.
B. B. Hanshaw, W. Back, and R. G. Deike.
Economic Geology, Vol 66, No 5, p 710-724, August 1971. 7 fig, 2 tab, 70 ref.

Descriptors: *Water chemistry, *Diagenesis, *Calcite, *Dolomite, *Karst, Aquifers, Water circulation, Groundwater movement, Hydrogeology, Aquifer characteristics, Florida, Magnesium, Calcium, Geochemistry.
Identifiers: *Dolomitization.

Most modern disordered dolomite is found in dynamic environments. Solutions associated with modern dolomite formation do not have a common Mg/Ca ratio; the ratio ranges from about 3 to 100. Groundwater circulation may have a significant role in formation of regional dolomites; one of the primary requirements is a large supply of magnesium ions. In the Tertiary aquifer of Florida, the magnesium content of the calcite is slightly lower (0.2 percent MgCO3) in the recharge areas than in the deeper confined parts of the aquifer system (2-4 percent MgCO3). The Mg/Ca ratio should be unity for the three-phase equilibrium, calcite-dolomite-water. The small amount of magnesium available from the zone of active circulation is probably insufficient for extensive dolomitization. However, dolomite may be forming in the zones of brackish water that underlie the Florida and Yucatan Peninsulas. The required magnesium may be derived from ocean water or from reflux brines formed when the hydrologic regimen is changed because of relative fluctuations of sea level. (Knapp-USGS)
W71-12597

THE KERCH-TAMAN HYDROGEOCHEMICAL AND MUD VOLCANIC REGION (O Kerchensko-Tamanskoy gidrogeokhimicheskoy i gryazevulkanicheskoy oblasti),
Sevastopol Inst. of Instrument Making, Sevastopol (USSR).
S. V. Al'bov.
Akademiya Nauk SSSR Doklady, Vol 197, No 1, p 175-177, 1971. 19 ref.

Descriptors: *Hydrogeology, *Groundwater, *Geochemistry, *Volcanoes, Geomorphology, Topography, Gases, Oil, Metals, Fresh water, Thermal water, Alpine, Hydrogen sulfide, Nitrogen, Methane, Phosphorus, Boron, Copper.
Identifiers: *USSR, *Mud volcanoes, Crimean Oblast, Kerch Peninsula, Taman Peninsula, Emanations (Magmatic), Mineralization, Carbonate water, Mercury, Antimony.

The Kerch-Taman region of the Crimean Oblast may be described as a complex hydrogeochemical and mud volcanic zone associated with alpine movements. The region contains fresh and mineralized carbonate, hydrogen sulfide, nitrogen and methane groundwaters and, to some extent, thermal water. Mud volcanoes are widespread in the region. The volcanic, carbonate, and nitrogen waters contain boron, lithium, mercury, arsenic, antimony, phosphorus, uranium, and other metals. Mercury, arsenic, silver, and copper are found in fresh waters of the Neogene limestone reefs of the Chokrakskoye and Koyashskoye Lakes of the Kerch Peninsula. The mud volcanic activity of the region is the indirect result of young magmatic emanations and cannot be used as an indicator of the oil- and gas-bearing potential of the region. The mud volcanic activity and carbonate waters have influenced the topography and geomorphology of the region, the formation of various geological structures, and the mineralogical composition and geochemistry of Kerch iron ores. (Josefson-USGS)
W71-12613

ADSORPTION OF MICROQUANTITIES OF YTTRIUM-91 FROM SEA WATER ON FTOROPLAST-4, POLYETHYLENE AND PAPER,
For primary bibliographic entry see Field 05A.
W71-12629

QUANTITATIVE DISTRIBUTION OF SUSPENDED MATTER IN THE ATLANTIC OCEAN (FROM THE SECOND CRUISE OF THE BELOGORSK),
For primary bibliographic entry see Field 02J.
W71-12630

EFFECT OF WATER TEMPERATURE AND SALINITY ON THE FORMATION OF OCEAN CURRENTS AT THE EQUATOR,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
L. M. Krivelevich.
Oceanology (USSR), Vol 10, No 3, p 308-314, December 1970. 7 p, 6 fig, 10 ref.

Descriptors: *Ocean currents, *Salinity, *Water temperature, Ocean circulation, Currents (Water), Oceanography, Mathematical models, Density, Heat transfer, Convection, Diffusion, Mixing, Sea water.

The velocity, temperature, and salinity fields in the equatorial plane were obtained by the joint solution dynamic equations of motion, heat transfer equations, and salt diffusion equations and the simultaneous use of the equations of state of sea water. The effect of salinity and of the quadratic terms of the equation of state on the formation of currents at the equator are insignificant. The computed zonal velocity field, which has a deep countercurrent, qualitatively reflects the real picture observed at the equator. (Knapp-USGS)
W71-12635

PRIMARY PRODUCTION IN RELATION TO THE HYDROLOGICAL REGIME OF A SEA BASIN (EXEMPLIFIED BY THE WHITE SEA),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 05G.
W71-12638

RIVER DISCHARGE OF TRACE ELEMENTS FROM THE TERRITORY OF THE USSR INTO MARINE BASINS,
Nauchno-Issledovatelskii Gidrokhimicheskii Institut, Novocherkassk (USSR).
For primary bibliographic entry see Field 05B.
W71-12639

VARIABILITY OF HYDROLOGICAL CONDITIONS IN THE NORWEGIAN SEA BASED ON MEASUREMENTS BY OCEAN WEATHER STATION MIKE,
Gidrometerologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
A. N. Spidchenko.
Oceanology (USSR), Vol 10, No 6, p 776-779, 1970. 4 p, 2 fig, 6 ref.

Descriptors: *Water temperature, *Salinity, *Variability, *Atlantic Ocean, *Oceanography, Sampling, Surveys, Statistics, Water chemistry, Hydrology, Monitoring, Data collections, Ocean currents, Ocean circulation.
Identifiers: Norwegian Sea.

The variability of temperature and salinity at different depths was analyzed from measurements by Ocean Weather Station Mike. The analysis is based on mean-square deviations computed from the data obtained, which were grouped by months for all the years of observation. Temperature and salinity were found to be most variable in the 200- to 400-m layer; furthermore, a salinity variability maximum was also recorded in the surface layer between May and September. The maximum can probably be explained by the greater activity of the East Iceland Current in summer and autumn. The maximum in the variability of temperature and salinity at depths of 200 to 400 m can be ascribed to two factors: (1) water advection, and (2) high vertical temperature and salinity gradients in the 200- to 400-m layer, which is intermediate between the Atlantic and deep waters of the Norwegian Sea. (Knapp-USGS)
W71-12640

IONIC COMPOSITION OF THE WATER UNDER ICE,
For primary bibliographic entry see Field 02C.
W71-12641

EXPERIMENTAL STUDIES OF THE THERMAL STRUCTURE AND TURBULENT HEAT EXCHANGE IN THE SURFACE LAYER OF THE SEA,
Moscow State Univ. (USSR). Dept. of Marine Physics.
A. G. Voskanyan, A. A. Pivovarov, and G. G. Khundzhua.
Oceanology (USSR), Vol 9, No 4, 449-456, 1970. 8 p, 5 fig, 1 tab, 6 ref.

Descriptors: *Water temperature, *Salinity, *Sea water, *Heat flow, *Heat balance, Oceanography, Heat budget, Heat transfer, Convection, Advection, Turbulence, Solar radiation.
Identifiers: Turbulent heat exchange.

The results of analysis of observational data on radiant energy fluxes, temperatures, salinity and temperature gradients in the surface layer of the sea are discussed from the viewpoint of the formation of homogeneous layers, and of the diurnal variations of the heat balance with depth and time and of the coefficient of turbulent heat exchange. With clear sky and calm weather the formation of a homogeneous layer is shown to result primarily from thermal factors that lead to density instability. The location of the lower boundary of the homogeneous layer is in good agreement with the position of the zero stability boundary. The turbulent heat flux near the sea surface is shown to be negative. The depth at which this flux changes sign is less in the daytime and greater at night. The turbulent heat exchange coefficients attain their peak values at night and are lowest in the daytime. The dirunal variations in the exchange coefficient attenuate with depth. The computed results are tabulated and graphed. (Knapp-USGS)
W71-12642

CARBOHYDRATES IN THE BOTTOM SEDIMENTS OF THE CENTRAL PACIFIC,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
V. Ye. Artem'yev.
Oceanology (USSR), Vol 9, No 4, p 508-513, 1970. 6 p, 2 fig, 1 tab, 15 ref.

Descriptors: *Organic matter, *Bottom sediments, *Pacific Ocean, *Carbohydrates, Organic compounds, Clays, Sampling, Chemical analysis, Mud.
Identifiers: Polysaccharides.

The total contents of carbohydrates were determined in samples of natural deep-sea sediments of various genetic types. The analyses were made aboard ship. The deep-sea pelagic sediments studied included red clays of various types, zeolite, clays, and radiolarian and carbonate oozes. The contents of carbohydrates in the pelagic oozes of the central part of the Pacific ranged from 214 to 1605 micrograms/gram, averaging 602 micrograms/gram of air-dried sediment. The organic matter is a diagenetically stable complex, with polysaccharides apparently predominating. (Knapp-USGS)
W71-12643

CALCULATING POTASSIUM CONTENT AND POTASSIUM RADIOACTIVITY OF SEA WATER FROM MEASURED SALINITY,
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
N. I. Buyanov.
Oceanology (USSR), Vol 9, No 4, p 561-564, 1970. 4 p, 2 tab, 7 ref.

Descriptors: *Sea water, *Salinity, *Potassium, *Radioisotopes, *Potassium radioisotopes, Sampling, Water chemistry, Water analysis, Chlorides, Radioactivity, Radioactivity techniques.

A computational method is suggested for determining the potassium content and potassium beta-radioactivity in the water of the open sea from the known salinity. Relationships between the salinity and potassium content of sea water as well as between the salinity and potassium beta-radioactivity of sea water are presented. Tabulated data are given for determining the potassium content and potassium beta-radioactivity of sea water from the measured salinity in the range from 20-40 parts per thousand. (Knapp-USGS)
W71-12645

DISTRIBUTION OF LONG-LIVED RADIONUCLIDES AND WATER CIRCULATION IN THE TROPICAL ATLANTIC,
For primary bibliographic entry see Field 05B.
W71-12648

PHOSPHORITE NODULES IN THE BOTTOM SEDIMENTS OF THE GULF OF ADEN,
Akademiya Nauk Nauk URSR, Kiev. Instytut Geologichnykh Nauk. Academy of Sciences of the Ukrainian SSR, Kiev, Institute of Geological Sciences.
For primary bibliographic entry see Field 02J.
W71-12650

SATURATION OF WATER OF THE SEA OF OKHOTSK WITH CALCIUM CARBONATE,
Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
Yu. I. Lyakhin.
Oceanology (USSR), Vol 10, No 6, p 789-795, 1970. 7 p, 3 fig, 2 tab, 23 ref.

Descriptors: *Water chemistry, *Calcium carbonate, *Carbon dioxide, *Saturation, Sedimentation, Water chemistry, Chemical precipitation, Ice, Sea ice, Freezing, Melting, Carbonates, Equilibrium.
Identifiers: *Sea of Okhotsk.

The upper 200-m layer of water in the Sea of Okhotsk is saturated with calcite throughout the year. In summer, saturation of the surface waters with CaCO3 is 300-400%, but in winter less than 150%. Below the 200-m level, saturation gradually decreases, reaching minimal values (about 70%) in the layer with minimum oxygen (800-1200 m). Saturation of the bottom water with calcium carbonate is almost 80% in the South basin. During intensive ice formation, solid CaCO3 particles separate out in brine cells in the sea ice. When the ice melts, these particles may sink to the bottom and accumulate in sediments at depths of up to 250 m. (Knapp-USGS)
W71-12659

VERTICAL DISTRIBUTION PATTERNS OF DISSOLVED ORGANIC CARBON IN SEA WATER AND INTERSTITIAL SOLUTIONS,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 05B.
W71-12660

DETERMINATION OF MICROQUANTITIES OF NICKEL AND COBALT IN SMALL WEIGHED PORTIONS OF MARINE SUSPENDED MATTER (FROM THE BALTIC SEA AND ATLANTIC OCEAN),
For primary bibliographic entry see Field 05A.
W71-12662

AN NMR AND CALORIMETRIC STUDY OF THE INTERACTIONS BETWEEN LANTHANIDE IONS AND WATER,
New Mexico State University, University Park. Water Resources Research Inst.
Edward R. Birnbaum.
Available from the National Technical Information Service as PB-202 856, $3.00 in paper copy, $0.95 in microfiche. (1971). 3 p, 3 ref. A-023-NMEX (1).

Descriptors: *Bonding, *Nuclear magnetic resonance, Water chemistry, *Ions, Stable isotopes, Enthalpy, Thermal properties.
Identifiers: *Water complexes, *Lanthanide ions, Acetonitrile, Isotropic shifts.

The interaction of lanthanide ions with water in acetonitrile has been studied. The measured enthalpy is surprisingly small (less than-2.0 kcal/mole) precluding calculation of thermodynamic parameters. The isotropic proton shift measured for the praseodymium (III) and neodymium (III) water complexes at ligand to metal ion mole ratios less than 50 have the opposite sign from the isotropic shift measured in pure water. The absence of strong hydrogen-bonding of the solvent and second coordination sphere to the first coordination sphere in acetonitrile is proposed as an explanation for the change in sign. The pattern of the proton isotropic shifts in acetonitrile closely resemble the 017 isotropic shifts measured for water solutions of lanthanide ions. The similarity suggests that both these shifts result from a contact interaction whereas the proton shifts in water are dominated by a pseudo-contact interaction.
W71-12695

MODELS OF MINERALIZED SOLUTION-COLLAPSE STRUCTURES FROM DRILLING STATISTICS: AN AID TO EXPLORATION,
Geological Survey, Knoxville, Tenn.
For primary bibliographic entry see Field 08A.
W71-12696

STRUCTURAL ASPECTS OF AMIDE-WATER SYSTEMS,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. E. Lindstrom.
Available from the National Technical Information Service as PB-202 876, $3.00 in paper copy, $0.95 in microfiche. Completion Report, June, 1971. 7 p. OWRR Project A-024-CONN (2).

Descriptors: *Ureas, Degradation (Decomposition), Solubility, *Nitrogen compounds, Aqueous solutions, Solutes, Solvents, Water chemistry.
Identifiers: *Amide-water, *Amides.

Studies have been carried out to evaluate parameters affecting solute-solvent interactions in amide-water systems. A kinetic study, accomplished conductimetrically, has shown that the degradation of urea in aqueous solutions up to 8 M, and at temperatures between 25 and 45 deg C, is a relatively slow, first-second order reversible reaction. A second study, involving a determination of the relative solubilities of methyl salicylate and methyl benzoate in aqueous solutions of various urea and hydrochloric acid concentrations, suggests the formation of a proton-urea complex. A salting-in constant was found which was in accord with the model for the proposed complex salt. Finally, dilatometric studies were made of the aqueous solutions of 17 amides. Apparent molar volume data were obtained for each amide in solutions ranging from the infinitely dilute up to the pure amide. The partial molar volumes of methyl, ethyl and propyl groups were found to vary according to the site and type of substitution on the carbonyl-nitrogen moiety. Nearly all of the amides studied exhibit a minimum in their apparent molar volume vs. mole fraction plots. It is suggested that the location and the depth of the minima reflect the degree of solute-solvent and solute-solute interaction.
W71-12701

THE DEAD SEA--A SINKHOLE,
Desert Research Inst., Beersheba (Israel).
M. R. Bloch, and L. Picard.
Zeitschrift der Deutsche Geologische Gesellschaft, Sonderheft Hydrogeologie u. Hydrogeochemie, p. 119-128, 1970. 7 fig, 14 ref.

Descriptors: *Arid lands, *Drainage basins, *Saline lakes, *Sinks, Saline water-freshwater interfaces, Mixing, Saline water systems, Chemical reactions, Chemical analysis, Geomorophology, Laboratory tests, Geological time, Geohydrologic units.
Identifiers: *Dead Sea, *Israel.

The entire southern Dead Sea basin is distinguished by an extended belt of thick salt masses reaching into great depths. By contrast, the submarine topography of the northern Dead Sea is distinguished by a markedly large hollow 400 m deep and 400 sq km in area. Since the southern part has a maximum depth of 6 m, the northern part is regarded as the Dead Sea proper. Tectonic theories of the origin of this deep water trough have been disregarded because of the unlikelihood of such a major tectonic phenomenon occurring in isolation. It is therefore hypothesized that a salt stock existed in the deepest part of the trough which was dis-

solved by large influxes of fresh water during the late Pleistocene leaving behind a huge 'sinkhole'. Evidence for the existence of such salt bodies in the northern basin is cited. Experiments with salt crystals in solution in breakers have demonstrated a 'teapot effect' in which the overhanging rim of a dissolving crystal protects the flanks, resulting in a flat surface. It is argued that just such an effect occurred during the dissolution of the northern Dead Sea salt stock, flattening it ot a salt mirror. Possibly within a few thousand years, furthur dissolution of the salt stock furthur lowered its mirror to the present flat floor of the 'sinkhole'. (Casey-Arizona)
W71-12751

GEOHYDROLOGY OF DONIPHAN COUNTY, NORTHEASTERN KANSAS,
Kansas State Geological Survey, Lawrence.
For primary bibliographic entry see Field 02F.
W71-12795

CHEMISTRY OF NATURAL WATERS--II. ALKALINITY,
National Inst. for Water Research, Congella (South Africa). Regional Lab.
P. H. Kemp.
Water Research, Vol 5, No 7, p 413-420, July 1971. 3 tab, 6 ref.

Descriptors: *Volumetric analysis, *Water chemistry, *Water analysis, *Alkalinity, *Carbonates, Electrochemistry, Bicarbonates, Hydrogen ion concentrations, Electrolytes, Calcium, Magnesium.
Identifiers: Electrometric titration.

The alkalinity of natural waters and its determination by electrometric titration are discussed. Consideration is given to its stoichiometric division into bicarbonate, carbonate and hydroxide forms, and these are shown to be related to the corresponding ionic concentrations. Comparison of the values of the total alkalinity found by titration and calculation is a useful check on the accuracy of a water analysis. (Knapp-USGS)
W71-12799

ELECTRODE DETERMINATION OF FLUORIDE IN ILL-CHARACTERIZED NATURAL WATERS,
Naval Research Lab., Washington, D.C.
T. B. Warner.
Water Research, Vol 5, No 7, p 459-465, July 1971. 4 tab, 11 ref.

Descriptors: *Water analysis, *Chemical analysis, *Fluorides, Electrochemistry, Rivers, Lakes, Estuaries, Aqueous solutions.
Identifiers: Specific-ion electrodes.

Fluoride concentrations in natural waters, such as estuaries, rivers, or lakes, may be measured using a specific ion electrode and a known-addition technique in conjunction with a high-ionic-strength buffer that fixes pH near 5.5 and includes cyclohexanediamine tetraacetic acid to free fluoride bound by some complexing ions. No additional information, such as interfering ion concentrations or ionic strength, is needed. Measurements may be made in waters containing as much as 25 mg per liter Al, 125 mg per liter Fe, 20 g per liter Ca, or 12.5 g per liter Mg. Results are accurate to about 0.02 mg per liter. The relative standard deviation is about 2% when fluoride is 1 mg per liter and up to 5% when fluoride is 0.1 mg per liter. (Knapp-USGS)
W71-12800

QUALITY CONSIDERATIONS IN SUCCESSIVE WATER USE,
Colorado Univ., Boulder. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W71-12801

CONTRIBUTION OF ATMOSPHERIC CHLORIDE IN WATER FROM SELECTED COASTAL STREAMS OF CENTRAL CALIFORNIA,
Miami Univ., Oxford, Ohio. Dept. of Geology.
A. D. Baldwin.
Water Resources Research, Vol 7, No 4, p 1007-1012, August 1971. 3 fig, 2 tab, 14 ref.

Descriptors: *Water chemistry, *Chlorides, *California, *Chemistry of precipitation, Rainfall, Runoff, Provenance, Salts, Aerosols, Rain water, Rain, Water quality, Surf, Aqueous solutions.
Identifiers: *Atmospheric chlorides.

Chemical quality and discharge data were collected and analyzed from five streams draining watersheds between Half Moon Bay and Santa Cruz, California, to determine the contribution of atmospheric chloride to these coastal basins. Fifty-nine percent of the total chloride leaving the basins underlain by Tertiary sedimentary rocks per year is atmospheric in origin. Nineteen percent of this atmospheric chloride contribution is introduced dissolved in rainwater, whereas the remaining 40% is brought into the basins as fine particulate dust, in 'fog drip,' or as an aerosol. (Knapp-USGS)
W71-12813

GROUNDWATER CHEMISTRY AND HYDROLOGY OF THE HANDHILLS LAKE AREA, ALBERTA,
Research Council of Alberta, Edmonton.
A. Vanden Berg, and D. H. Lennox.
Report 69-1, 1969. 49 p, 17 fig, 3 tab, 20 ref, 2 append.

Descriptors: *Hydrogeology, *Groundwater movement, *Water chemistry, Recharge, Discharge (Water), Water yield, Permeability, Aquifer characteristics, Geochemistry, Water wells, Aquicludes, Topography, Mapping.
Identifiers: Alberta (Canada).

The groundwater chemistry and hydrology in an area of 275 square miles in Alberta, Canada were studied to correlate chemical properties of the groundwater with position in the flow system and chemical nature of the sedimentary rocks. The Bearpaw Formation, a relatively impermeable marine shale, underlies the area and is an effective, although not complete, barrier to the downward movement of water. The Edmonton Formation overlies the Bearpaw Formation and forms the aquifer through which groundwater moves from its recharge area in the Hand Hills toward the discharge area in the lowlands surrounding Bullpound Creek. The permeability of this formation is generally extremely low, but it supplies water for local farm needs. Chemically the groundwater ranges from hard bicarbonate water with less than 500 ppm total solids in the recharge area to soft sulfate water with more than 3,000 ppm total solids in the discharge area. The two basic types of areal variation in groundwater composition are: (1) those due to simple aging of the groundwater as it moves through the subsurface and (2) those due to inhomogeneities in the flow medium. Interpretation of the hydrologic and chemical data strongly favors the classical picture of recharge in the uplands and discharge in the lowlands. (Knapp-USGS)
W71-12820

EFFECTS OF SALT CONCENTRATION AND CATION SPECIES ON THE MEASURED CATION-EXCHANGE CAPACITY OF SOILS AND CLAYS,
Kyushu Univ., Fukuoka (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 02G.
W71-12821

DETERMINATION OF CATION-EXCHANGE CAPACITY WITH THE POTASSIUM SPECIFIC-ION ELECTRODE,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02G.
W71-12822

UPTAKE OF MANGANESE-54 BY A BENTONITE CLAY IN SEA WATER,
For primary bibliographic entry see Field 05B.
W71-12823

A THERMODYNAMIC STUDY OF SODIUM-STRONTIUM EXCHANGE ON WYOMING BENTONITE,
Soils Lab., Beltsville, Md. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02G.
W71-12824

THERMODYNAMICS OF INTERLAYER ADSORPTION OF WATER IN CLAYS, 2. MAGNESIUM VERMICULITE,
Shell Development Co., Houston, Tex. Exploration and Production Research Div.
For primary bibliographic entry see Field 02G.
W71-12825

X-RAY DIFFRACTION AND ADSORPTION ISOTHERM STUDIES OF THE MONTMORILLONITE-WATER SYSTEM,
Wisconsin Univ., Milwaukee.
For primary bibliographic entry see Field 02G.
W71-12826

SORPTION OF SOME ANILINES BY Mn-, Co-, Ni-, Cu-, Zn- AND Cd-MONTMORILLONITE,
Hebrew Univ., Jerusalem (Israel). Dept. of Geology.
For primary bibliographic entry see Field 02G.
W71-12827

SOME NEW ASPECTS OF THE APPLICATION OF DIELECTRIC SPECTROSCOPY FOR THE STUDY OF A PLANT WATER REGIME,
Kazan State Univ. (USSR).
For primary bibliographic entry see Field 02I.
W71-12983

GEOCHEMICAL CHARACTERIZATION OF THE WATERS IN THE TATRA MOUNTAINS,
Wyzsza Sakola Rolnicza, Kracow, (Poland).
Krystyna Oleksynowa.
Acta Hydrolbiol. 12 (1): 1-110. Illus. 1970. (Engl. summ).
Identifiers: Carbon, Carbonates, DI, Erosion, Geochemical, Mountains, Oxide, Poland, Tatra, Waters.

The structure of water, its physicochemical properties, and the resulting geochemical processes are reviewed. The chemical composition of waters in 17 basins of the Tatra Mts (mountains) is described. Three types of basins are reflected; those built of crystalline and sedimentary rocks, and mixed ones. Computations are made on the CO2-H2)-CaCO3 system and disturbances in its equilibrium are ascertained; there is more CaCO3 in water than would result from the partial pressure of CO2 in the air. Also, an attempt to calculate the chemical erosion of the Tatra Mts. is made, based on empirical data. Finally, the analytical materials (about 900 analyses with 6 features) were worked out by 4 statistical methods applied by geochemicsts to rocks and waters.--Copyright 1971, Biological Abstracts, Inc.
W71-12995

PHYSICO-CHEMICAL PROPERTIES OF SOLUTIONS FORMED DURING INTERACTION OF WATER WITH ROCKS OF THE TYRNYAUZ ORE FIELD (Fiziko-khimicheskiye svoystva rastvorov, obrazuyushchikhsya pri vzaimodeystvii vody s gornymi porodami Tyrnyauzskogo rudnogo polya),
Politekhnicheskii Institut, Novocherkassk (USSR).
A. A. Kurdyukov, and Z. I. Kurdyukova.

In: Kharakteristika i formirovaniye khimicheskogo sostava atomosfernykh vod i vod sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 34-42, 1970. 2 fig, 2 tab, 15 ref.

Descriptors: *Water chemistry, *Water properties, *Physicochemical properties, *Chemical analysis, *Aqueous solutions, Geochemistry, Thermodynamics, Equilibrium, Rocks, Granites, Hydrogen ion concentration, Acidity, Alkalinity, Oxidation-reduction potential, Enthalpy, Heat balance, Free energy, Geologic investigations, Geologic formations.
Identifiers: *USSR, Caucasus, Tyrnyauz ore field, Ore deposits, Roof rocks, Skarns, Hornfels, Marble, Metasomatism, Mineralization.

The interaction of water with rocks is considered in water chemistry to be a primary factor in the formation of the salinity and chemical composition of groundwaters. This process is clearly evident in the water-bearing sedimentary rocks which contain halite, gypsum, calcite, dolomite and other readily-soluble minerals. To study the physico-chemical properties of equilibrium aqueous solutions of fractured rocks, a chemical analysis was made of granites, roof rocks and skarns of the Tyrnyauz deposit of the Northern Caucasus. Solutions in the granites examined to a depth of 1,500 m exhibited stable properties (pH was 9.2; Eh was minus 0.4 v; buffer action was 1.2/v; and the amount of decrease in free energy and heat content was 14.5-15.5 and 20-26 kcal/mol, respectively). Roof rocks of the granite massif were divided into four groups based on the oxidation-reduction properties of the equilibrium solutions: (1) base solutions with negative Eh values; (2) base solutions with positive Eh values; (3) acidic solutions with positive Eh values; and (4) acidic solutions with negative Eh values. Ore-bearing skarns formed metasomatically at the contact of biotite hornfels and marble supplement the second group (base solutions with positive Eh values) and have strongly alkaline pH and positive Eh values. The interaction of water with rocks is generally accompanied by an appreciable loss of heat. The amount of heat lost may influence the formation of the salt composition of groundwaters and the migration of the chemical elements. (See also W71-12434) (Josefson-USGS)
W71-439

2L. Estuaries

TEMPERATURE, DISSOLVED OXYGEN AND SALINITY DATA FOR THE PENOBSCOT RIVER ESTUARY, 1966-1970.
Maine Univ., Orono, Cooperative Fishery Unit.

Available from the National Technical Information Service as PB-202 629, $3.00 in paper copy, $0.95 in microfiche. Maine University Water Resources Center Information Memorandum, June 1971. 17 p, 3 ref. OWRR A-999-ME (6).

Descriptors: *Estuaries, *Water quality, *Hydrologic data, *Data collections, *Maine, Estuarine fisheries, River flow, Runoff, Water temperature, Dissolved oxygen, Salinity.
Identifiers: *Penobscot River estuary (Maine).

Temperature, dissolved oxygen, and salinity data for the Penobscot River estuary in Maine are presented for the period 1966-1970. Sampling stations were located at five sites from Bangor to Bucksport Harbor, a distance of approximately 18 nautical miles. Each station was sampled three times between low-slack and high-slack tide during daylight hours of a given day. As an aid to interpreting year to year differences, monthly flow data for the Penobscot River are shown. Inferred distribution of temperature, dissolved oxygen and salinity at midflood tide for each sampling period are reported as isopleth diagrams. (Woodard-USGS)
W71-12246

BIOLOGICAL EFFECTS OF OIL POLLUTION IN THE SANTA BARBARA CHANNEL,
University of Southern California, Los Angeles.

For primary bibliographic entry see Field 05C.
W71-12262

SEDIMENT BUDGET FOR CAPE BLAS SHOAL, FLORIDA,
Florida State Univ., Tallahassee. Dept. of Oceanography.
Donald K. Stauble.
Coastal Research Notes, Vol 3, No 5, p 6-7, June 1971. 2 p, 4 ref.

Descriptors: *Sedimentation, *Sediment distribution, *Bays, *Shoals, *Florida, Erosion, Surface waters, Currents (Water), Investigations.
Identifiers: *Cape Blas Shoal (Fla).

The sediment budget for the past 30 years was calculated across Cape San Blas shoal in northwest Florida. The method of comparing two contour maps and constructing a third contour map of the differences was used. From this, rates of erosion and deposition were calculated. Erosion exceeds deposition in this open system. Transport direction appears to be south and east and the shoal therefore is migrating in an easterly direction. This is opposed to the general westward drift found along the Apalachicola River delta coast. The area of study is located on the Panhandle coast of Florida, west of Apalachicola Bay (off Gulf County) and is bounded by latitudes 29 deg 31 ft. 40 in. N and 29 deg 44 ft. 00 in. N and longitudes 85 deg 17 ft. 30 in. W and 85 deg 31 ft. 30 in. W. (Woodard-USGS)
W71-12264

CHAPTER 2. PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF ESTUARIES,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 02A.
W71-12349

SEISMIC SURVEY LOCATES POTENTIAL GOLD DEPOSITS IN THE BERING SEA,
Geological Survey, Menlo Park, Calif.
A. R. Tagg, and H. G. Greene.
Ocean Industry, Vol 16, No 8, p 40-43, August 1971. 4 fig, 16 ref.

Descriptors: *Seismic studies, *Beaches, *Alluvial channels, *Placer mining, *Gold, Gravels, Sands, Alluvium, Glacial drift, Sand bars, Surveys, Investigations, Alaska, Exploration.
Identifiers: Seismic prospecting.

Recent interpretation of a high-resolution seismic survey made by the U.S. Geological Survey and the U.S. Bureau of Mines off Nome, Alaska indicates several areas of potentially high concentration of heavy minerals. The mapped area extends from 10 miles east to 10 miles west of Nome and about 10 miles offshore and is part of northwestern Norton Sound, an embayment of the northern Bering Sea. Data obtained from drill-hole logs and bottom samples were used in interpreting the seismic records and provided the basis for extending the coastal plain geology at Nome into the offshore area. Bottom surface features with potentially commercial gold deposits were located and included discontinuous stream channels, several beach ridges and at least five outwash fans. Sub-bottom features included many buried stream channels, several areas of glacial drift and at least three shallow faults. Also noted were acoustical 'sinks' that are thought to be gravels associated with buried stream channels and beach ridges. (Knapp-USGS)
W71-12358

DYNAMICS OF THE TRANSITION ZONE BETWEEN FRESH AND SALT WATERS IN COASTAL AQUIFERS,
California Univ., Berkeley. Coll. of Engineering.
For primary bibliographic entry see Field 02F.
W71-12367

A SEDIMENTARY MODEL FOR DETERMINING PALEOTIDAL RANGE,
Illinois Univ., Urbana. Dept. of Geology.
G. de V. Klein.
Geological Society of America Bulletin, Vol 82, No 9, p 2585-2592, September 1971. 2 fig, 1 tab, 39 ref.

Descriptors: *Coasts, *Stratigraphy, *Water levels, *Paleohydrology, *Tides, Water level fluctuations, Sedimentary structures, Sedimentation, Deltas, Shores, Continental margin, Tidal effects.
Identifiers: Tidal range.

Prograding clastic tidal coastlines in embayed areas, lagoons, and open coasts generate a graded, fining-upward sequence of sediments. This graded sequence is produced by a distinct zonation of sediment transport precesses across a clastic intertidal flat. These transport zones are (1) tidal bedload transport (producing subtidal sand), (2) combination of tidal bedload transport and emergence runoff prior to exposure (producing low tidal flat sand), (3) alternation of bedload and suspension sedimentation (producing midflat interbedded sands and muds), and (4) suspension sedimentation (producing high tidal flat muds and clays). The top of the graded, finingupward sequence consists of clay-sized sediment and coincides with the level of mean high tide. In Holocene sediments, the thickness of the interval representing low tidal flat, midflat and high tidal flat sediments coincides with mean tidal range. In fossil equicalents, the thickness of similar sequences gives a quantitative measurement of paleotidal range. (Knapp-USGS)
W71-12454

MORPHOLOGY AND SEDIMENTS OF REDONDO SUBMARINE FAN, SOUTHERN CALIFORNIA,
University of Southern California, Los Angeles. Dept. of Geological Sciences.
B. E. Haner.
Geological Society of America Bulletin, Vol 82, No 9, p 2413-2432, September 1971. 15 fig, 5 tab, 35 ref. NSF Grant GB 8206 ONR Cont NR 083-144.

Descriptors: *Deltas, *Sedimentary structures, *Sedimentation, Turbidity currents, Bed load, Slopes, Geomorphology, Seismic studies, Erosion, Channel morphology, Distribution patterns, Stratigraphy, Braiding.
Identifiers: Redondo (Cal), San Pedro basin (Cal).

Redondo Submarine Fan fills the northern end of the San Pedro basin, one of the inshore fault-controlled basins of the continental borderland off southern California. An analysis was made of detailed echo soundings and sub-bottom seismic profiles to study segmentation and channel morphology of alluvial fans. This revealed a threefold division of the submarine fan along its axis. These segments are indicated by changes in fan gradient and a channel pattern unique to each segment. The upper fan is steepest, and the channel is entrenched. Intersection of channel with fan surface and meandering characterize the middle segment, while a slightly steeper lower fan gradient results in a braided channel. Fault movement is responsible for the steepening of upper fan segment. Turbidity currents are confined to the channel of the upper fan segment, but below the intersection zone they can spread laterally over the fan surface. Associated internal sedimentary structures reveal these different deceleration environments. Consideration of the total geometry of sand units, lateral and longitudinal changes in sedimentary facies, and channel morphology provides a model which has greater scope and flexibility than previous sedimentary longitudinal facies models. It can be applied to the vertical changes observed in stratigraphic sections and the distribution of surface sediments on present submarine fans. (Knapp-USGS)
W71-12456

DELTA: TERM AND CONCEPT,
Chevron Oil Field Research Co., La Habra, Calif.

For primary bibliographic entry see Field 02J.
W71-12457

EASTWARD SUBMARINE CANYON AND THE SHAPING OF THE BLAKE NOSE,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
R. M. Pratt.
Geological Society of America Bulletin, Vol, 82, No 9, p 2569-2576, September 1971. 5 fig, 25 ref.

Descriptors: *Continental slope, *Canyons, *Erosion, *Ocean currents, *Turbidity currents, Sedimentary structures, Geomorphology, Scour, Currents (Water).
Identifiers: Eastward Canyon (SC).

Eastward Canyon has formed along the north side of the Blake nose, part of the east edge of the Blake Plateau which lies off the southeast coast of the United States. The canyon has a length of about 40 mi and a maximum depth of about 500 m from the crest of the north side. The south wall of the canyon coincides with the north wall of the Blake nose and has a relief of over 2,000 m. The erosional processes which formed the canyon and which maintain the sharp declivity at the base of the escarpment have eroded and shaped the Blake nose. Eastward Canyon has no extension onto the Blake Plateau and no river counterpart on land and therefore must have been formed by the deep western boundary undercurrent flowing south along the Blake Escarpment. The currents might gain considerable strength as they are deflected around the Blake nose. Present aspects of the Canyon are largely Pleistocene in age. The lower end of the canyon merges into the Blake-Bahama abyssal plain at about 5,030 m, which implies that the solution of carbonate sediment is an important factor in erosion. Similar erosional processes may be important in maintaining the axis of maximum depth close to the Blake-Bahama escarpment farther to the south. (Knapp-USGS)
W71-12458

NEARSHORE CELL CIRCULATION AND THE FORMATION OF GIANT CUSPS,
Oregon State Univ., Corvallis. Dept. of Oceanography.
P. D. Komar.
Geological Society of America Bulletin, Vol 82, No 9, p 2643-2650, September 1971. 5 fig, 2 tab, 17 ref.

Descriptors: *Beaches, *Sedimentary structures, *Sediment transport, *Surf, *Rip currents, Currents (Water), Coasts, Waves (Water), Littoral drift, Sand waves.
Identifiers: *Beach cusps.

Large beach cusps are common along many shorelines, sometimes isolated but at times forming a rythmic series of such forms with uniform spacing. The role of cell circulation, rip currents, and associated longshore currents in producing such cusps is examined. Laboratory wave basin experiments were performed to determine how the cell circulation of water modifies an initially smooth and straight sand beach. In all cases, cusps develop in the lee or rip currents so that a series of cusps is formed with the same spacing as the rip currents. These are compared with giant cusps and beach cusps observed on natural beaches. An equilibrium cusp development was found in which, having produced the cusps, all cell circulation and other longshore currents suddenly cease to exist; the rip currents disappear. The equilibrium state consists of a balance between the forces that tend to drive a longshore current from an oblique wave approach to the flanks of the cusps, and the forces that normally produce the cell circulation. Cusps, having been produced by rip currents, can therefore be observed on beaches although the rips are no longer present. (Knapp-USGS)
W71-12459

STATE-OF-THE-ART OF LITTORAL DRIFT MEASUREMENTS,
Tetra Tech., Inc, Pasadena, Calif.
For primary bibliographic entry see Field 02J.
W71-12468

SEA BOTTOM VELOCITY PROFILES ON THE CONTINENTAL SHELF SOUTH-WEST OF ENGLAND,
Bristol Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 02E.
W71-12473

SPATIAL AND TEMPORAL STRUCTURE IN A TEMPERATURE INTERTIDAL COMMUNITY WITH SPECIAL EMPHASIS ON GEMMA GEMMA (PELECYPODA:MOLLUSCA),
Manitoba Univ., Winnipeg. Dept. of Zoology.
Roger H. Green, and Katharine D. Hobson.
Ecology. 51 (6): 999-1011. Illus, 1970.

Descriptors: *Mollusks, *Aquatic animals, *Growth rates, *Water temperature.
Identifiers: Community, Gemma-Gemma, Growth, Invertebrates, Mortality, Pelecypoda, Spatial, Structure, Temporal, Tidal.

In the region of Barnstable Harbor, Massachusetts, 67 spp. of larger invertebrates were found in 3 faunal associations characteristic of different tide levels. The number of species per sample was highest at the intermediate tide level. Temperatures of sediments and densities of several species were followed for a year at 2 intertidal levels (60 cm and 90 cm above mean low water). Temperature variation was lower at the 60 cm level than at the 90 cm level at all times of the year, and at both levels was higher in spring than at any other time of the year. In 3 of the 4 spp. studied, spatial variation in density and rate of density change was significantly higher at the 60 cm location than at the 90 cm location. The mortality rate for adult G. gemma was higher at 60 cm (where density was lower) than at 90 cm, while the reverse was true for young-of-year. Release of young began sooner in the spring at 90 cm than at 60 cm. The growth rate of G. gemma at Barnstable Harbor was much lower than that reported at Union Beach, New Jersey, although at both places virtually all growth took place in summer. At Barnstable Harbor the maintenance requirements were 20-30 times higher in summer than in early spring. The Q10 within the temperature range 5-20 deg C was 4.1. G. gemma at 90 cm had less time to feed than at 60 cm, but had higher requirements for population maintenance because of an older age structure and a higher density. The growth rate of G. gemma was higher at 90 cm than at 60 cm.--Copyright 1971, Biological Abstracts, Inc.
W71-12494

PRODUCTIVITY OF MARINE MOLLUSCS AS DEPENDENT ON THEIR LIFETIME (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
V. E. Zaika.
Okeanologiya. 10 (4): 702-708. Illus, 1971 (Engl summ).

Descriptors: *Mollusks, *Biomass, *Productivity.

The specific rates of productivity (C is the production of a population in unit biomass per unit time) computed from the published data for 21 spp. of marine and freshwater molluscs are discussed. The value of C is shown to be lower the greater the duration of life of a given species. The average diurnal value of C from 1 yr's measurements for the molluscs studied is in the range from 0.0003 to 0.3.--Copyright 1971, Biological Abstracts, Inc.
W71-12496

POLLUTION OF THE OCEAN WATERS OF ITALY: CAUSES, EFFECTS ON THE BIOLOGICAL ENVIRONMENT, CONTROL AND PREVENTION (IN ITALIAN),
Laboratorio Centrale di Idrobiologia, Rome (Italy).
For primary bibliographic entry see Field 05C.
W71-12506

THE MOUTH OF CALANQUES BETWEEN MARSEILLE AND LA CIOTAT: STUDY OF POPULATIONS AND SEDIMENTS (IN FRENCH),
Aix-Marseille Univ. (France). Faculte des Sciences.
Claude Poizat.
Recuel de Travaux Sta Mar Endoume Fac Sci Marseille. 61 (45): 367-436, Illus, Maps, 1969 (Engl summ).

Descriptors: *Environmental effects, *Sediment distribution, *Coasts, *Animal populations, *Estuaries.
Identifiers: Calanques, France, La-Ciotat, Marseille.

The sediment and animal distribution in the Marseilleveyre, Puget and Devenson coast of the Marseille region were studied. The relationship between animal abundance and biogenic substances is discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12508

PRIMARY PRODUCTIVITY IN THE TAGUS AND SADO ESTUARINES FROM MAY 1967 TO MAY 1968 (IN PORTUGUESE),
For primary bibliographic entry see Field 05A.
W71-12509

TIDAL INFLUENCE ON THE APPARENT TRANSPIRATIONAL RHYTHM OF THE WHITE MANGROVE,
University Coll., Durban (South Africa).
For primary bibliographic entry see Field 02D.
W71-12511

RELATIONS OF PHYTOPLANKTON TO THE MARINE HABITAT IN THE STRAITS OF FLORIDA AND ADJACENT AREAS: I. THE DINOFLAGELLATES,
Univ. Miami, Fla. Inst. of Marine Science.
E. J. Ferguson Wood.
Nova Hedwigia. 18 (2-4): 645-763. Illus, 1969.

Descriptors: *Biomass, *Dinoflagellates, Phytoplankton, Aquatic habitats.
Identifiers: Florida.

The naked dinoflagellates are significant in the biomass of primary producers in tropical and subtropical waters of the Atlantic, especially in the waters of or derived from the North Equatorial Current. The occurrence of dinoflagellates in the Straits of Florida, and the relation of these organisms to the characteristics of the water in which they were found are considered.--Copyright 1971, Biological Abstracts, Inc.
W71-12513

CONTRIBUTIONS TO THE ECOLOGY OF LARVAL AND JUVENILE LINED SOLE, ACHIRUS LINEATUS, IN TAMPA BAY, FLORIDA,
Charles R. Futch.
Fla Dep Natur Resour Div Mar Resour Leafl Ser. Part I (17): 1-5. Illus. Map. 1970.
Identifiers: Achirus-Lineatus, Bay, Ecology, Florida, Food, Habits, Juvenile, Larval, Lined, Migration, Sole, Spawning, Tampa, USA.

Spawning, food habits by stomach analysis and descriptions are given of specimens captured in Tampa Bay from May through Nov. 1962 and in May and June 1963. The role of temperature and day length in spawning migrations is discussed.--Copyright 1971, Biological Abstracts, Inc.

W71-12529

SWARMING OF PLATYNEREIS DUMERILII IN THE BAY OF ARCACHON, (2ND REPORT),
C. Cazaux, and P. J. Labourg.
Vie Milie U Ser A Biol Mar. 20 (3A): 559-564. 1969.
Identifiers: Arcachon, Bay, France, ND, Platynereis-Dumerilii, Swarming.

The swarming of P. dumerilii in the Bay of Arcachon is studied here. The swarming of the heteronereis of the observed population takes place during the summer months with a sharp maximum at the end of Aug. These results confirm observations concerning the swarming of a P. dumerilii population in another part of the Bay of Arcachon, France.--Copyright 1971, Biological Abstracts, Inc.
W71-12541

PLEISTOPHORA SP. (MICROSPORIDIA: NOSEMATIDAE); A NEW PARASITE OF SHRIMP,
Bureau of Commercial Fisheries, Galveston, Tex. Biological Lab.
Kenneth N. Baxter, and R. H. Rigdon.
J Invertebr Pathol. 16 (2): 289-291. Illus. 1970.
Identifiers: Host, Microsporidia, New, Nosematidae, Parasite, Pleistophora-Sp, Record, Shrimp.

Penaeus setiferus and P. aztecus from Galveston Bay, Texas, USA were found infected with Pleistophora sp.--Copyright 1971, Biological Abstracts, Inc.
W71-12551

MOLLUSKS AND BENTHIC ENVIRONMENTS IN HILLSBOROUGH BAY, FLORIDA,
Bureau of Commercial Fisheries, St. Petersburg Beach, Fla. Biological Lab.
J. L. Taylor, J. R. Hall, and C. H. Saloman.
Fishery Bulletin, Vol 68, No 2, p 191-202, February 1971. 2 fig, 5 tab, 42 ref, append.

Descriptors: *Sediments, *Mollusks, *Bays, *Florida, *Water pollution effects, Ecology, Benthic fauna, Benthos, Water pollution sources, Industrial wastes, Domestic wastes, Water quality.

Analysis of benthic mollusks and sediments at 45 stations in Hillsborough Bay, Florida, showed that the diversity and abundance of mollusks was affected by bottom conditions which were influenced in varying degrees by domestic and industrial pollution and dredging. Nineteen stations had no living mollusks, 18 stations had one to four mollusk species, and 8 stations had mollusks well represented by numerous species and large numbers of individuals. Stations with no living mollusks were termed unhealthy, and others were designated marginal or healthy on the basis of the mollusks present. From station data, isopleths connecting similar areas indicated that 42% of the bay bottom was unhealthy, 36% marginal, and 22% healthy. Infrequent occurrence of the American oyster (Crassostrea virginica) further suggests that the major portion of Hillsborough Bay was seriously contaminated. An appendix was a checklist of the 64 species of mollusks collected in the bay. (Woodard-USGS)
W71-12600

COMPARATIVE DISTRIBUTION OF MOLLUSKS IN DREDGED AND UNDREDGED PORTIONS OF AN ESTUARY, WITH A SYSTEMATIC LIST OF SPECIES,
Bureau of Commercial Fisheries, St. Petersburg Beach, Fla. Biological Lab.
J. E. Sykes, and J. R. Hall.
Fishery Bulletin, Vol 68, No 2, p 299-306, February 1971. 2 fig, 2 tab, 22 ref, append.

Descriptors: *Sediments, *Estuaries, *Mollusks, *Dredging, *Florida, Canals, Estuarine fisheries, Bays, Surveys, Benthos, Benthic fauna.

A survey of benthic mollusks in Boca Ciega Bay, Florida, showed a much smaller number and variety of species in the soft sediments in dredged canals than in the predominantly sand and shell sediments in undredged areas. Samples contained an average of 60.5 live mollusks and 3.8 species in undredged areas and 1.1 individuals and 0.6 species in dredged canals. A list of mollusks collected in this survey and in past studies is appended. (Woodard-USGS)
W71-12601

INVESTIGATION OF THE RELIEF AND BOTTOM DEPOSITS ON THE SOUTHWEST AFRICAN SHELF,
For primary bibliographic entry see Field 02J.
W71-12649

DISPERSION COMPUTATION AND TEMPERATURE SIMULATION FOR THE CONNECTICUT RIVER ESTUARY BY MATHEMATICAL MODEL,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 05B.
W71-12673

ENVIRONMENTAL FACTORS IN COASTAL AND ESTUARINE WATERS, BIBLIOGRAPHIC SERIES - VOLUME I, COAST OF OREGON,
Pacific Northwest Water Lab., Corvallis, Oreg.
George R. Ditsworth.
Available from the National Technical Information Service as PB-202 878, $3.00 in paper copy, $0.95 in microfiche. Water Pollution Control Research Series Publication WP-20-2, October, 1966. 61 p, 394 ref. EPA Program 16070---10/66.

Descriptors: *Oregon, *Coasts, *Estuaries, *Bibliographies, *Oceanography, Marine fisheries, Coastal structures, Coastal engineering, Publications, Water pollution sources.
Identifiers: Coastal waters, Coastal geology, Literature surveys.

This annotated bibliography comprises 394 references to published and unpublished literature pertaining to research and engineering on the natural phenomena of Oregon's coastal and estuarine waters and their adjacent land masses. References are alphabetically listed by principal author or corporate author (organization) under one or more of seven general subject headings: Marine biology (75 ref); Climate, (4 ref); Fisheries, (35 ref); Geology, (57 ref); Hydrology, (30 ref); Chemical and Physical Oceanography, (164 ref); Bibliographies, Literature Surveys and Compilations, (29 ref). References were selected by systematically researching about 15 major publication or information sources. (See also W71-12705)
W71-12704

ENVIRONMENTAL FACTORS IN COASTAL AND ESTUARINE WATERS, BIBLIOGRAPHIC SERIES - VOLUME II, COAST OF WASHINGTON,
Pacific Northwest Water Lab., Corvallis, Oreg.
George R. Ditsworth.
Available from the National Technical Information Service as PB-202 879, $3.00 in paper copy, $0.95 in microfiche. August, 1968. 80 p, 346 ref. EPA Program 16070--08/68.

Descriptors: *Washington, *Coasts, *Estuaries, *Bibliographies, *Oceanography, Marine fisheries, Coastal structures, Coastal engineering, Publications, Water pollution sources.
Identifiers: Coastal waters, Coastal geology, Literature surveys.

This annotated bibliography comprises 346 references to published and unpublished literature pertaining to research and engineering on the natural phenomena of Washington's coastal and estuarine waters and their adjacent land masses. References are alphabetially listed by principal author or corporate author (organization) under one or more of seven general subject headings: Marine Biology (124 ref); Fisheries (56 ref); Geology (101 ref); Chemical and Physical Oceanography (5 ref); Water Pollution (45 ref); AND Bibliographies, Literature Surveys and Compilations (15 ref). References were selected by systematically searching about 25 major publication or information sources. (See also W71-12704)
W71-12705

FLORIDA COASTAL ZONE APPLIED RESEARCH NEEDS.
Florida State Dept. of Natural Resources, Tallahassee. Coastal Coordinating Council.

Revised May 10, 1971. 38 p, 1 map.

Descriptors: *Florida, *Coasts, *Research and development, *Coordination, Water law, State governments, Administrative agencies, Planning, Programs, Management, Project planning, Institutions, Water policy, Competing uses, Water resources development, Water utilization.

Research is necessary to provide background data for answers to coastal management policy questions and to indicate options for management decisions in protecting and developing Florida's coastal lands and waters. One of the Coastal Coordinating Council's functions is to coordinate research needs and capabilities within the state. This document presents an extensive list of coastal zone research and informational needs as a first step in this coordination process. The Council requests that it be advised of completed, on-going, or planned research that is applicable to any of the presented coastal zone needs. This would assist the Council in avoiding duplication of effort among researchers and might allow the Council to provide the researchers with such assistance as information, contacts, proposal assistance, contract monitoring, and others. In addition, the Council would be better able to bring together those with the research needs, capabilities, and funds. Certain research proposals aimed at specific needs may be funded by in-house support from the Council; these needs are given a priority listing in the document. (Johnson-Florida)
W71-12762

ELECTRODE DETERMINATION OF FLUORIDE IN ILL-CHARACTERIZED NATURAL WATERS,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 02K.
W71-12800

EFFECT OF MIXING ON OXYGEN UPTAKE RATE OF ESTUARINE BOTTOM DEPOSITS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-12835

PRODUCER-CONSUMER RELATIONSHIPS IN THE SEA: II. CORRELATION BETWEEN MYTILUS PIGMENTATION AND DENSITY AND COMPOSITION OF PHYTOPLANKTONIC POPULATIONS IN INSHORE WATERS,
Norwegian Inst. of Seaweed Research, Trondheim.
For primary bibliographic entry see Field 07B.
W71-12905

THE NORTHER GASCONY CONTINENTAL SHELF AND THE GRANDE VASIERE: BIONOMICAL STUDY,
Brest Scientific Coll. (France). Laboratoire de Zoologie.
Michel Glemarec.
Rev Trav Inst Peches Mar. 23 (3): 301-310. Illus. 1969.
Identifiers: Bionomical, Continental, Fishery, France, Gascony, Grande, Invertebrate, Lobster, Northern, Shelf, Species, Spiny, Vasiere.

The spiny lobster population of the area appears impoverished but many possibilities are open for its management and fishery. Several other invertebrate species are identified in this study.--Copyright 1971, Biological Abstracts, Inc.
W71-12913

TROPICAL AQUACULTURE IN HONG KONG,
California Univ., Riverside.
E. N. Anderson, Jr.
J Trop Geogr. 30: 11-16. Map. 1970.
Identifiers: Aquaculture, Cultivation, Fish, Hong-Kong, Oyster, Tropical.

Hong Kong aquaculture shows that the south Chinese sophistication in managing land resources (Anderson, 1968) extends to water resources as well. The oyster appears to be well-adjusted to the wild fluctuations in temperature and salinity of its habitat, and is the base for a thriving industry. In pond fish cultivation, a balanced stocking of several fish species has developed, and makes a more efficient use of resources than stocking with 1 sp. could achieve.--Copyright 1971, Biological Abstracts, Inc.
W71-12916

A PRELIMINARY STUDY OF THE RELATIONSHIP OF SALT-PONDS AND WILDLIFE--SOUTH SAN FRANCISCO BAY,
California Dept. of Fish and Game, Sacramento.
For primary bibliographic entry see Field 06G.
W71-12947

ADVANCES IN MARINE BIOLOGY, VOL. 8,
Frederick S. Russell, and Maurice Yonge.
481 p, Illus, Academic Press Inc., Ltd.: London, England; New York, N. Y., 1970. Pr. $19.50.
Identifiers: Biology, Book, Marine, Organisms.

This volume of the continuing series offers 4 papers reviewing special problems currently under investigation. The 1st, dealing with particulate and organic matter in sea water, outlines the methodology involved in analysis of non-living matter and particulate organic carbon, elementary composition and biochemical composition, relationships of organic and inorganic materials in sea water; a section is also devoted to experimental studies of non-living particulate matter with a general discussion following of the aggregation process and the dynamics of production and consumption of non-living particulate matter in the sea. The 2nd selection discusses estuarine fish farming: its topography, fertility, selection of organisms by salinity, the natural history of the species, sources of young fish and prawns, the food (including culture of algal pasture) of cultivated fish, management of Brackish-water fishponds, rates and profitability of the enterprise. The problem of oil pollution of the sea is dealt with next, including the removal of spilt oil through bacterial degradation and other biological processes, dispersal, sinking and recovery and the mode of action and toxicity of solvent-emulsifiers. The concluding chapter deals with scatological studies of the Mollusca, their morphology for classification, biological significance of forms, use as a systematic index, evolutionary trends and biodeposition of suspension feeding bivalves. In addition to author, taxonomic and subject indexes, the volume offers cumulative indexes of authors and titles from previous volumes in the series.--Copyright 1971, Biological Abstracts, Inc.
W71-12962

THE DISTRIBUTION OF TWO CRAB SPECIES ON THE PORIRUA HARBOUR MUD-FLATS,
G. Stephenson.
Bull Natur Sci (Wellington). 1: 21-26. Illus. 1970.
Identifiers: Crab, Distribution, Flats, Harbor, Mud, New-Zealand, Porirua, Species.

A statistical analysis of data collected from Porirua Harbour, on the Wellington (New Zealand) west coast, shows that 2 spp. of brachyuran Crustacea (Hemiplax hirtipes, Helice crassa) occupy different areas of the intertidal zone.--Copyright 1971, Biological Abstracts, Inc.
W71-12969

FREELIVING MARINE NEMATODES FROM NORTH SEA MUD FLATS AND SALT MARSHES,
Kiel Univ. (West Germany). Zoologisches Institut.
Sievert Lorenzen.
Veroeff Inst Meeresforsch Bremerhaven. 11 (2): 195-238. Illus. 1969. (Engl. summ.).
Identifiers: Desmolaimus-Bulbulus, Flats, Living, Marine, Marshes, Monhystera-Anophthalma, Mud, Nematodes, New, North, Salt, Sea, Species, Stephanolaimus-Spartinae, Synonymy, Thalassoalaimus-Pirum.

Ninety species of freeliving marine nematodes were collected in salt marshes of the west coast of Schleswig-Holstein and in creeks leading through the salt marshes. Additional details to the descriptions of 33 spp. are presented, and synonymy is given for 5 spp. Chromadorina supralitoralis nom. nov. is designated for C. granulopigmentata Gerlach 1965 nec (Wieser 1951). Four species are new to science: Stephanolaimus spartinae, Desmolaimus bulbulus, Monhystera anophthalma, Thalassoalaimus pirum.--Copyright 1971, Biological Abstracts, Inc.
W71-12971

MIGRATIONS AND GROWTH OF DEEP-SEA LOBSTERS, HOMARUS AMERICANUS,
Bureau of Commercial Fisheries, Boothbay Harbor, Maine. Biological Lab.
Richard A. Cooper, and Joseph R. Uzmann.
Science. 171 (3968): 288-290. Illus. Map. 1971.
Identifiers: Deep, Growth, Homarus-Americanus, Lobsters, Migrations, Sea.

In distinct contrast to the restricted movements of coastal stocks of lobsters (H. americanus), those inhabiting the outer continental shelf undertake extensive seasonal migrations. Of 5710 tagged lobsters released on the outer continental shelf off New England from April 1968 to June 1969, 400 were recaptured by April 1970. The distribution of the recoveries demonstrated shoalward migration in spring and summer and a return to the edge of the shelf in fall and winter. Deep-sea lobsters have a faster rate of growth than coastal lobsters; growth increments at molting and the frequency of molting are greater.--Copyright 1971, Biological Abstracts, Inc.
W71-12972

FISHES ASSOCIATED WITH DRIFTING KELP, MACROCYSTIS PYRIFERA, OFF THE COAST OF SOUTHERN CALIFORNIA AND NORTHERN BAJA CALIFORNIA,
California Inst. of Tech., Corona del Mar.
For primary bibliographic entry see Field 02I.
W71-13019

TIDAL FLOODING DYNAMICS: ITS INFLUENCE ON SMALL MAMMALS IN BARRIER BEACH MARSHES,
Emory Univ., Atlanta, Ga. Dept. of Biology.
Donald J. Shure.
Amer Midland Natur. 85 (1): 36-44. 1971.
Identifiers: Barrier, Beach, Dynamics, Flooding, Mammals, Marshes, Microtus-Pennsylvanicus, Peromyscus-Leucopus, Spartina-Patens-M, Tidal, Vegetation, Zapus-Hudsonicus.

Tidal effects within bayshore marshes of a New Jersey barrier beach habitat have definite influences on the composition, abundance, and distribution of small mammals. Microtus pennsylvanicus occupied the salt marshes, being significantly associated with the Spartina patens cover of those areas less influenced by tidal flooding. Mosquito-control ditches also influenced the distribution and movements of Microtus. Microtus was highly abundant on hummocks lining the mosquito ditches, though ditches themselves restrict the movements of Microtus. In some salt marshes, ice-formed sand ridges along the bay-shore have gradually terminated tidal flooding. Spartina domination of early successional stages is followed by the gradual increase of shrubby vegetation in later stages. Microtus domination of herbaceous stages shifted to the occurrence and increased abundance of Zapus hudsonius and Peromyscus leucopus in later herb-shrub stages.--Copyright 1971, Biological Abstracts, Inc.
W71-13028

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

THE DESIGN OF ARTIFICIAL RECHARGE SCHEMES,
Vattenbyggnadsbyran Ltd., Stockholm (Sweden).
For primary bibliographic entry see Field 05D.
W71-12406

THE PRINCIPLES AND PRACTICE OF PRETREATMENT FOR ARTIFICIAL RECHARGE,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 05F.
W71-12407

CLOGGING PROCESSES AND OPTIMIZATION OF BASIN RECHARGE,
Water Planning for Israel Ltd., Tel Aviv.
For primary bibliographic entry see Field 04B.
W71-12408

METHODS OF SUSTAINING GOOD INFILTRATION RESULTS,
North Holland. Provincial Waterworks (Netherlands).
For primary bibliographic entry see Field 04B.
W71-12409

FUNDAMENTAL VARIATIONS IN THE WATER QUALITY WITH PERCOLATION IN INFILTRATION BASINS,
Institute for Water Research Ltd., Dortmund (West Germany).
For primary bibliographic entry see Field 04B.
W71-12410

WATER QUALITY ASPECTS OF INTERMITTENT SYSTEMS USING SECONDARY SEWAGE EFFLUENT,
Water Conservation Lab., Phoenix, Ariz.
For primary bibliographic entry see Field 05D.
W71-12411

PRACTICAL EXPERIENCES OF WELL RECHARGE,
Water Planning for Israel Ltd., Tel Aviv.
For primary bibliographic entry see Field 04B.
W71-12412

ARTIFICIAL GROUNDWATER RECHARGE PRACTICE IN ISRAEL: ECONOMIC ANALYSIS,
Mekoroth Water Co., Tel Aviv (Israel).
For primary bibliographic entry see Field 04B.
W71-12413

SANITARY SIGNIFICANCE OF COLIFORM BACTERIA IN RECHARGE WELLS,
Mekoroth Water Co., Tel Aviv (Israel).
For primary bibliographic entry see Field 05B.
W71-12414

RECHARGE OF CARBONACEOUS SALINE AQUIFER OF SOUTH FLORIDA WITH TREATED SANITARY WASTEWATER,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 05G.
W71-12415

ARTIFICIAL RECHARGE INVESTIGATIONS BY THE WATER RESOURCES BOARD,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04B.
W71-12416

PHYSICAL ASPECTS OF ELECTROFILTRATION,
Jadavpur Univ., Calcutta (India). Dept. of Physical Chemistry.
For primary bibliographic entry see Field 05D.
W71-12467

3B. Water Yield Improvement

HYDROLOGIC RESPONSE OF WATERSHEDS TO LAND USE MANAGEMENT,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 04C.
W71-12251

FITTING METHODS FOR CONCEPTUAL CATCHMENT MODELS,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W71-12257

SOIL WATER EVAPORATION: REDUCTION BY SIMULATED TILLAGE,
Agricultural Research Service, Mandan, N.D. Soil and Water Conservation Research Div.
W. O. Willis, and J. J. Bond.
Soil Science of America Proceedings, Vol 35, No 4, p 526-529, July-August 1971. 6 fig, 1 tab, 19 ref.

Descriptors: *Evaporation, *Soil water, *Evaporation control, *Cultivation, Water conservation, Land management.
Identifiers: *Soil water evaporation.

Soil water loss with time as affected by simulated tillage to depths of 2.5 and 7.5 cm was measured from soil columns in a constant temperature room. The 60-cm soil columns were initially wetted from the top to about 33% by volume and then covered for 2 days to prevent evaporation. The soils were tilled 1, 4, 7, and 18 days after the columns were covered. Tillage effectively terminated first stage drying, and evaporative losses were reduced by tilling. The highest reduction of evaporation was associated with the earliest tilling, which showed over 50% reduction in evaporative loss for more than 22 days after tilling. The reduction in water loss was reflected in higher soil water content throughout the column length below the tilled layer. Evaporation reduction was only slightly better with 7.5-cm than with 2.5-cm tillage. (Knapp-USGS)
W71-12266

THE SAN JUAN ECOLOGY PROJECT, PHASE 1,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 02B.
W71-12280

SOME RESULTS OF SINGLE CLOUD PYROTECHNIC SEEDING IN FLORIDA, 1970,
Atlantic Oceanographic and Meteorological Labs., Miami, Fla., Experimental Meteorology Lab.
William L. Woodley, Joanne Simpson, Alan H. Miller, Steven MacKay, and Richard Williamson, et al.
National Oceanic and Atmospheric Administration Technical Memorandum ERLTM-AOLM 10, November 1970. 87 p, 22 fig, 9 tab, 32 ref, append. Bur. Reclam. Contact 14-06-W-176.

Descriptors: *Cloud seeding, *Artificial precipitation, *Silver iodide, *Florida, Weather modification, Convection, Atmospheric physics, Nucleation, Environmental effects, Aircraft, Photogrammetry.

Cloud seeding experiments with silver iodide were conducted over South Florida on nine days in the spring and early summer of 1970. Five aircraft participated, one for seeding, photogrammetry and in-cloud measurements, one for in-cloud measurements near cloud base, one for mid-levels, one for following top heights and occassional penetrations, and one for dropsondes and high-level observation. Altogether thirteen seeded clouds and sixteen unseeded cloud controls were studied. Five seeded clouds exhibited the cut-off tower growth mode, two underwent hesitation growth and six grew explosively. Of the sixteen control clouds, ten reached cumulonimbus stature. For the first 40 minutes after seeding, the average seeded minus control rainfall difference was about 100 acre-ft, or more than 100% for the entire cloud lifetimes. (Woodard-USGS)
W71-12418

WATER STORAGE AND ALFALFA PRODUCTION ON LEVEL BENCHES IN THE NORTHERN PLAINS,
Agricultural Research Service, Mandan, N.Dak. Northern Great Plains Research Center.
For primary bibliographic entry see Field 03F.
W71-12598

THE INFLUENCE OF A WINDBREAK ON EVAPORATION,
Israel Meteorological Service, Bet-Dagan. Agrometeorological Div.
J. Lomas, and E. Schlesinger.
Agricultural Meteorology, Vol 8, No 2, p 107-115, March 1971. 6 fig, 1 tab, 15 ref.

Descriptors: *Evaporation, *Advection, *Windbreaks, *Evaporation pans, *Arid lands, Wind velocity, Estimating equations, On-site data collections, Microclimatology, Measurement, Climatic data, Albedo, Regression analysis.
Identifiers: *Agroclimatology, *Evaporimeters, *Potential evapotranspiration.

While most investigators report considerable evaporation reduction behind windbreaks, others maintain that since radiation balance in the immediate vicinity of windbreaks is largely unchanged, their effects on evaporation should be minimal, except when advective conditions occur. Data from 2 previous investigations on wind-breaks were reviewed to test this contention, and to check how well actual results could be predicted by the Penman formula. Unfortunately, measurements of climatic data were not made at the study sites, and data were therefore used from meteorological stations several km distant. At one site (Mivtahim), the net radiation equivalent was 6.5 mm/day, so no advected energy was used for evaporation. At the other site (Eliot), net radiation accounted for only 2.3 mm/day, indicating advection was responsible for most of the evaporation observed. Differences between protected and unprotected plots at Mivtahim were just barely significant at the 10% level while they were significant at the 1% level at Eilot. The Penman formula accorded well with Class A pan measurements. The Piche-type evaporimeter showed considerable differences between protected and unprotected plots, even at Mivtahim, and its use is criticized. (Casey-Arizona)
W71-12746

PROJECT SKYWATER: METEOROLOGY MEETS ECOLOGY,
Bureau of Reclamation, Denver, Colo.
R. C. James.
Paper Nat Conf Forest, Weather, Assoc Environ, Soc Amer Forest Amer Meteorol Soc, Atlanta, Ga, May 1971. 17 p, 6 ref.

Descriptors: Meteorology, *Ecology, *Cloud seeding, Vegetation, Silver iodide, *Ecosystems, Investigations, *Weather modification, Climatology, Effects, Nucleation, Contracts, Snowpacks, Precipitation (Atmospheric), Alpine, Forests, Tundra, Dendrochronology, Microbiology, Microorganisms, Snowfall.
Identifiers: Microbiological growth, Skywater Project, Supercooled clouds, San Juan Mountains, Colo.

The Bureau of Reclamation Project Skywater program has studied many facets of weather modification, with university groups, state agencies, private organizations, and Federal agencies doing much of the research work under negotiated contracts. One contract was awarded to develop a plan for systematic study of the effects the Colorado River Pilot Project might have upon the ecology of the San Juan Mountains area of Colorado. The final report under this contract recommended that 27 ecological and related studies be undertaken. Fourteen of the studies divided between the alpine ecosystem and the forest ecosystem are in progress to determine the effects that increased precipitation has upon plant and animal life in the area. Project Skywater must be certain that precipitation management programs do not have an unacceptable impact upon the environment, but do provide tools for managing the water resources of the nation. (USBR)
W71-12898

3C. Use of Water of Impaired Quality

MODEL STUDY TO PREDICT SALT DISTRIBUTION AND CONCENTRATION OF WATER IN SOIL PROFILES,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02G.
W71-12247

CHEMICAL CHARACTERISTICS OF THE COPPICE DUNE SOILS IN PARADISE VALLEY, NEVADA,
Agricultural Research Service, Reno, Nev. Soil and Water Conservation Div.
For primary bibliographic entry see Field 02G.
W71-12383

CRITICAL SALT REGIME OF IRRIGATED SOILS AND GROUNDWATER DRAINAGE IN THE COTTON GROWING ZONE (Kriticheskiy solevoy rezhim oroshayemykh pochv i drenazh gruntovykh vod v zone vozdelyvaniya khlopka),
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
N. G. Minashina.
Pochvovedeniye, No 1, p 104-113, January 1970. 5 tab, 12 ref.

Descriptors: *Groundwater, *Drainage, *Irrigation water, *Irrigation practices, *Land reclamation, Salts, Saline soils, Salinity, Water loss, Leaching, Seasonal, Water utilization, Chlorides, Sulfates, Toxicity, Evapotranspiration, Plants, Cotton.
Identifiers: *USSR, Mineralization, Growing season, Salt balance, Oases.

A method based on the salt balance is proposed for calculating the stable salt regime of irrigated soils as a function of the critical depth of groundwater and its mineralization, taking into account the mineralization of irrigation water and the irrigation regime. The salt regime of irrigated soils may be considered 'critical' when the concentration of soil solutions periodically approaches the toxicity level for plants but does not exceed it. A formula is derived from a salt balance equation for computing the critical groundwater mineralization for 5 Cen-

tral Asian oases; based on this formula, the critical (minimum necessary) groundwater drainage for sustaining a stable salt regime for a long period is calculated. The equation of the water-salt balance of soil solutions may be used to precalculate the salt regime of irrigated soils for various groundwater depths and mineralization and different irrigation regimes, and to determine the most economical leaching and drainage rates for specific natural-irrigation conditions. It is recommended that the groundwater be maintained at a depth of at least 2 m and that drainage be provided to ensure an annual removal of 1,500-4,000 cu m of water per hectare, which will amount to 15-25% of total water consumption. 'Subirrigation' (plant nutrition from groundwater) should be used in part of the irrigated land fed by fresh groundwater; in this case, the effective drainage must be 15,000-20,000 cu m/ ha/ yr, if not provided by natural means. (Josefson-USGS)
W71-12606

IRRIGATION AND SALT PROBLEMS IN RENMARK, SOUTH AUSTRALIA,
State Univ. of New York, Buffalo. Dept. of Geography.
C. H. V. Ebert.
Geographical Review, Vol 61, No 3, p 355-369, July 1971. 9 fig, 9 ref.

Descriptors: *Arid lands, *Saline water systems, *Crop response, *Irrigation practices, *Drainage systems, Soil salinity, River systems, Agriculture, Soil conservation, Sodium compounds, Chlorides, Saline soils, Topography, Subsoil, Land management, Water quality, Soil types.
Identifiers: *South Australia, *Murray River.

Nowhere else in the world has there been more blatant land misuse and resource deterioration than in irrigated regions of arid lands. Whenever the fine balance between overwatering and underwatering is upset, critical salinization problems occur. The Murray River system supports about nine-tenths of all the irrigated land in water-short Australia, and most of the oases along this river are endangered by salt encroachment. Australian science is highly developed, and a survey of the problems along the Murray should give some insight into the problem of closing the gap between available scientific knowledge and its practical application in arid land irrigation. The Renmark oasis is very far upstream and therefore its return flow and salinized drainage water seepage affects all centers downstream. The region is subdivided into 5 soil and topographic zones starting with the highly saline floodplain to the arid thornscrub, marking the border of the oasis. Crop types in any area depend on drainage and soil factors, with the best land going to citrus. All irrigation water comes from the Murray. Rainfall is erratic, and in drought years low flow and high evaporation result in high NaCl levels. This, in combination with saline water drainage may raise downstream NaCl levels to as much as 500 ppm. The soil types of the region are varied and in differing situations, either over or underwatering may occur, depending upon combinations of circumstances which are analyzed and discussed. Among various efforts to deal with the problem are the wider use of under-tree sprinkler systems and diked-in evaporation basins. Nevertheless, the salinity continues to worsen. The author feels the situation can be arrested and improved through more careful land and irrigation management practices and by the installation of a more effective drainage system to prevent reentry of saline water into the Murray. (Casey-Arizona)
W71-12740

PLANT GROWTH SUPPRESSION ON SALINE MEDIA: INTERACTIONS WITH LIGHT,
Salinity Lab., Riverside, Calif.
For primary bibliographic entry see Field 02I.
W71-12745

SOME CHARACTERISTIC ASPECTS OF MICROCLIMATE ON SALINE AND ALKALI SOILS IN THE ZONE BETWEEN MURES AND CRISUL ALB,
Institutul Agronomic din Timisoara (Rumania).
C. V. Oprea, L. Rusu, and Oltea Prelipceanu.
Inst Agron Timisoara Lugr Stiint Ser Agron. 11: 123-131, Illus, 1968 (Engl and Russ summ).
Identifiers: Alkali, Characteristic, Climate, Crisul-Alb, Micro, Mures, Romania, Saline, Soils, Zone.

The typical microclimate is characterized by a high degree of dryness and heat. Air moisture values varied within the same temperature and moisture limits. The hard climatic conditions of the alkali soils do not favor plant development.--Copyright 1971, Biological Abstracts, Inc.
W71-12941

STUDIES ON THE PRODUCTIVITY OF VEGETABLE CROPS UNDER A PLASTIC GREENHOUSE: IV. THE ELIMINATION OF TOTAL WATER-SOLUBLE SALTS IN SOILS,
Ministry of Agriculture and Forestry, Shizuoka (Japan). Horticulture Research Station.
Mikiyo Kageyama, Takashi Masaki, and Masaichi Katai.
Bull Hort Res Sta Ser B (Okitsu). 8: 43-77. Illus. 1968. (In Jap. with Engl. summ.).
Identifiers: Crops, Elimination, Fertilizer, Greenhouse, Growth, Plastic, Productivity, Salts, Soils, Soluble, Under, Vegetable, Water.

Water-soluble salts caused by too much fertilizer, must be removed so that plant growth is not impaired. The efficiency of eliminating water-soluble salts from soil became greater as the amount of water applied increased. When different concentrations of salt solutions were passed through the soil, the salt remaining in the soil was proportional to the original salt concentration. The most salts were accumulated in volcanic soil, less in loamy soil and the least in sandy soil. Flood-watering gave the best results; however, the efficiency of elimination was only 25.6%. A ridge 80 cm in width was irrigated by flood-watering at 3 different water levels. Efficiency increased as the water level increased. In the mixed soil the water-soluble salts were leached down to a deeper sub-soil layer than in loamy soil.--Copyright 1971, Biological Abstracts, Inc.
W71-12967

3D. Conservation in Domestic and Municipal Use

MUNICIPAL AUTHORITY OVER WATERCOURSES AND SEWERS.
For primary bibliographic entry see Field 06E.
W71-12927

3F. Conservation in Agriculture

IRRIGATION WATER VALUES IN PORTIONS OF WYOMING'S TONGUE AND POWDER RIVER BASINS: A BUDGETING AND LINEAR PROGRAMMING ANALYSIS,
Wyoming Univ., Laramie. Div. of Agricultural Economics.
For primary bibliographic entry see Field 06A.
W71-12335

CHAPTER 3. CHEMICAL, PHYSICAL, AND BIOLOGICAL CHARACTERISTICS OF IRRIGATION AND SOIL WATER,
Department of Agriculture, Riverside, Calif., Salinity Lab.
For primary bibliographic entry see Field 02A.
W71-12350

CONTRIBUTIONS TO THE DETERMINATION OF THE LIMIT FOR MAIZE CULTURE ON SLOPE GROUNDS,
I. M. Balan.
Probl Agr. 21 (9): 33-40. 1969 (recd. 1970). (Engl., Fr. and Russ. summ.).

Descriptors: *Corn, *Crop production, *Erosion control, Water loss, Fertilizers, Run off, Slopes.
Identifiers: Bean-D, Cropping, Culture, Grounds, Maize-M, Strip.

High water losses due to run-off and lower soil humidity during the whole vegetation period on grounds with a slope greater than 15%, greatly affected the yield. Even on grounds with 5-15% slope, maize cultivation must be accompanied by measures for the prevention and control of run-off and soil erosion such as application of fertilizers, intercropping of maize and bean, putting drains between rows, and strip cropping.--Copyright 1971, Biological Abstracts, Inc.
W71-12477

CONTRIBUTIONS TO THE DETERMINATION OF AGROTECHNICS ON SLOPE GROUNDS (IN RUMANIA),
Ministerul Agriculturii si Silviculturii, Podu-Iloaie (Rumania). Agricultura Experiment Station.
I. Costache, P. Petrovici, N. Dumitrescu, G. Stoian, and A. Popa.
Probl Agr. 21 (9): 21-32. Illus. 1969. (Engl., Fr. and Russ. summ.).

Descriptors: *Crop production, *Rotations, Beans, *Soil management, *Fertilizers, *Erosion control, Slopes.
Identifiers: Agrotechniques, Bean-D, Grounds, Herbs, Maize-M, Pea-D, Perennial, Sunflower-D, Wheat-M.

For erosion and run-off control, cultivation of 2nd year perennial herbs, followed by wheat, pea, 1st year herbs, bean, sunflower and maize is adequate. Fertilizer application gives high increases in wheat, as well as in maize. Best results were obtained with the use of mixed N, P and manure fertilizers.--Copyright 1971, Biological Abstracts, Inc.
W71-12478

COMPARATIVE STUDIES AND ECONOMIC EVALUATION OF BASIC FORAGE CROPS UNDER IRRIGATION (IN BULGARIA),
Academy of Agricultural Sciences, Stara Zagora (Bulgaria). Inst. of Animal Husbandry.
S. Dimitrov, S. Kanev, Christozov, and T. Todorov.
Rastenievod Nauki, 6 (10): 157-167. 1969 (English summary).

Descriptors: *Crop production, *Irrigation, *Barley, *Wheat, *Soy beans, Forages, Costs, Crops.
Identifiers: Barley-M, Basic, Bean-D, Beet-D, Digestible, Feed, Lucerne-D, Maize-M, Minerals, Pea-D, Protein, Soy, Sugar, Under, Units, Wheat-M.

Largest yields of the grain forage crops were received from maize. Barley-wheat mixed crops were superior to barley grown alone, and soybean was superior to spring pea. Of the green fodder and silage crops, largest yields of feed units and digestible protein were obtained respectively from sugar beet and lucerne. Maize-soybean mixtures as catch crops after winter barley, winter and spring pea contributed much to production of green food and silage. The grain of maize and soybean gave the greatest amounts of feed units and that of soybean and pea, the greatest protein value. Of the green food and silage crops, the sugar beet and maize-soybean mixtures had the most feed units. Highest contents of digestible protein, C, P and carotene were found in lucerne.--Copyright 1971, Biological Abstracts, Inc.
W71-12479

THE EFFECT OF FERTILIZATION AND IRRIGATION ON THE BIOLOGICAL CHARACTERISTICS OF SOME MEADOW HERBS (IN RUSSIAN),
For primary bibliographic entry see Field 02I.
W71-12480

DRYLAND EVAPORATIVE FLUX IN A SUBHUMID CLIMATE: II. PLANT INFLUENCES,
Agricultural Research Service, Temple, Tex. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02D.
W71-12481

YIELD AND WATER USE BY DIFFERENT POPULATIONS OF DRYLAND CORN, GRAIN SORGHUM, AND FORAGE SORGHUM IN THE WESTERN CORN BELT,
Agricultural Research Service, Brookings, S. Dak. Soil and Water Research Div.
Tamlin C. Olson.
Agron J. 63 (1): 104-106. 1971.

Descriptors: *Corn, *Crop production, *Sorghum, *Planting management, *Soil moisture.
Identifiers: Belt, Corn-M, Dryland, Forage, Grain, Populations, Row, Sorghum-M, Spacing, Yield.

In South Dakota, grain yields of corn grown in 102-cm rows with 35000 plants/ha and in 51-cm rows with 45000 and 70000 plants/ha, respectively, decreased with increasing population in adverse soil-water seasons and were approximately constant during the more favorable growing seasons. Grain yields from grain sorghum planted in 102-cm rows with 175000 plants/ha and in 51-cm rows with 250000 and 350000 plants/ha were the same in adverse years but increased markedly with increasing population during the better growing seasons. Corn, grain sorghum, and forage sorghum all gave increasing total dry-matter yields with increasing population throughout the range of populations used. Water use was nearly the same for all crops within each year, although grain sorghum at the lowest population tended to use slightly less water.--Copyright 1971, Biological Abstracts, Inc.
W71-12482

SUBSTRATE MOISTURE LEVELS FOR GERMINATION TESTING OF SOME AGRICULTURAL SEEDS,
Instituto Biologico, Sao Paulo (Brazil).
Marly Vicente, Ailema Noronha, and K. Silberschmidt.
Ana Acad Brasil Cienc. 41 (4): 633-639. 1969.

Descriptors: *Planting management, *Crop production, *Water requirements, Beans, Corn, Rice, Sorghum, Vegetable crops.
Identifiers: Bean-D, Broccoli-D, Catjang-D, Corn-M, Eggplant-D, Germination, Moisture, Peanut-D, Pumpkin-D, Rice-M, Seeds, Sorghum-M, Substrate, Sunflower-D, Testing.

Seeds of cereals (corn, rice, sorghum), legumes (bean, catjang, lab-lab, peanut), sunflower, and vegetables (broccoli, eggplant, pumpkin, watermelon) were tested. Varying amounts for optimum germination of different species were observed. The water requirements of seeds may serve as a prognosis of the water requirements of the respective crop.--Copyright 1971, Biological Abstracts, Inc.
W71-12483

CORN YIELDS WITH FALL, SPRING, AND SIDEDRESS NITROGEN,
Illinois Univ; Urbana. Dept. of Agronomy.
L. F. Welch, D. L. Mulvaney, M. G. Oldham, L. V. Boone, and J. W. Pendleton.
Agron J. 63 (1): 119-123. 1971.

Descriptors: *Crop production, *Corn, *Nitrogen, *Fertilizers, Leaching.
Identifiers: Corn-M, Denitrification, Fall, Sidedress, Spring, Yields, Zea-Mays-M.

Studies in central and northern Illinois at 4 locations and 12 location-years were conducted with 5 rates of N applied in the fall and as spring-preplant. Sidedress N was also included at 1 of the 4 locations for 4 yr. Relative efficiency of the times of application was calculated by dividing the corn (Zea mays L.) yield increase from a given rate of N added at 1 time by the yield increase from the same rate of N applied at another time. At the Carthage and Hartsburg locations the 3-yr average relative efficiencies of fall-versus spring-applied N are about 0.8 and 0.9 (fall was 80 and 90% as effective as spring) at N rates of 67 and 134 kg/ha, respectively. Fall and spring N were about equally effective at 201 and 268 kg/ha of N. There was generally little yield response to N rates greater than 201 kg/ha at Carthage and Hartsburg. Fall and spring N gave similar corn yields for all rates of N at Urbana. For the 4-yr average at DeKalb, sidedress N was the most effective, spring N was intermediate, and fall-applied N was the least effective. The difference between spring and sidedress N was less than that between fall and spring N. There was considerable year-to-year variation in relative efficiency. The importance of the time at which conditions suitable for N loss occur is discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12484

EFFECTS OF SOIL-MOISTURE STRESS ON THE YIELD AND QUALITY OF FLOUR FROM WHEAT (TRITICUM AESTIVUM L.),
Arizona Univ., Tucson. Agricultural Experiment Station.
A. D. Day, and M. A. Barmore.
Agron J. 63 (1): 115-116. 1971.

Descriptors: *Wheat, *Irrigation, *Moisture, *Soil management, Soil-water-plant relationships.
Identifiers: *Flour, Stress, Triticum-Aestivum-M, Wheat-M, Yield.

Moisture stress at any stage of growth lowered wheat pastry flour quality. Moisture stress at the jointing stage resulted in a decrease in flour yield and an increase in flour protein, viscosity, and mixing curve area. Moisture stress at flowering resulted in an increase in flour protein, viscosity, and mixing curve area. Moisture stress at the dough stage decreased flour yield and increased flour protein, mixing, curve peak, and mixing curve area. Increases in viscosities and mixing curve areas of flour from grain from stressed plants were due to the increases in flour protein content. Changes in the alkaline water retention capacity and mixing curve peak values were not related to changes in protein content and must be due to other factors resulting from moisture stress.--Copyright 1971, Biological Abstracts, Inc.
W71-12485

INFLUENCE OF SOIL WATER REGIMES ON THE GROWTH AND NUTRIENT UPTAKE BY RICE (ORYZA SATIVA),
Indian Inst. of Tech., Kharagpur.
T. Stayanarayana, and B. P. Ghildyal.
J Indian Soc Soil Sci. 18 (1): 41-44. 1970.

Descriptors: *Crop production, *Soil-water-plant relationships, *Soil moisture, *Rice, *Flood irrigation.
Identifiers: Growth, Nutrient, Oryza-Sativa-M, Regimes, Rice-M, Soil, Uptake.

Plants grown under flooded conditions produced better shoot growth and higher grain yield than when grown under 60 cm water tension and saturated conditions. The weight of roots increased as the soil water content increased from 60 cm water tension to 5 cm flooding. Better growth of plants in the flooded treatment was possible due to the beneficial effect of Fe, Mn and P.--Copyright 1971, Biological Abstracts, Inc.
W71-12486

EFFECT OF THE CHLORCHOLINECHLORIDE (CCC) ON WINTER WHEAT YIELDS, (IN BULGARIAN),
Higher Inst. of Rural Economics, Sofia (Bulgaria).
G. Kozarev.
Pochvozn Agrokhim. 4 (6): 37-45. 1969 (Russ. and Engl. summ.).

Descriptors: *Fertilizers, *Chlorides, *Crop production, *Wheat.
Identifiers: Chlorocholine, Growth, Wheat-M, Winter, Yields.

The effect of CCC was tested on 2 winter wheat cultivars ('Bezostaya 1' and No. 301), grown at different levels of N (100 and 300 kg N/ha). The plants were treated with 2.5 and 5 kg CCC/ha, and applied at the 7th-8th leaf stage. With adequate soil moisture the treatment improved yields of 'Bezostaya 1.' It also affected the shortening and thickening of the lower internodes of the stem, increasing resistance. This effect of the chlorocholinechloride was more strongly manifested in the No. 301 variety and had an indirect effect on yields, particularly under conditions causing crop lodging. On No. 301, CCC enhanced total and productive tiller formation and the number and weight of the grain. In the case of drought and low N efficiency, CCC could have an adverse effect on both crops.--Copyright 1971, Biological Abstracts, Inc.
W71-12487

YIELD-DETERMINING PROCESS ANALYSIS AND APPLICATION TO LOWLAND RICE, YIELD-PREDICTION AND CULTURAL IMPROVEMENT: XCV. NITROGEN DEFICIENCY EFFECTS IN MIDDLE GROWTH PERIOD ON PHYSIOLOGICAL ACTIVITY OF RICE PLANT ROOTS,
National Inst. for Agricultural Science, Tokyo (Japan).
For primary bibliographic entry see Field 02I.
W71-12488

EFFECT OF DENSITY OF BROWN MEADOW IRRIGATED SOIL ON SEED GERMINATION, GROWTH AND YIELD OF MAIZE, (IN RUSSIAN),
E. I. Natroshvili.
Soobshch Akad Nauk Gruz SSR. 58 (3): 673-676. 1970. (Engl. summ.).

Descriptors: *Corn, *Crop production, *Soil management, Germination, *Plant growth, *Density, Seeds.
Identifiers: Irrigated, Maize-M, Meadow, Yields.

The optimal density of the soil for maize (Georgian variety) is 1.1 g/cm. On more porous or compact soils growth is very poor.--Copyright 1971, Biological Abstracts, Inc.
W71-12490

UNIVERSITY COLLEGE OF WALES, ABERYSTWYTH, MEMO-RANDIUM NO. 12 (1969). (THE ROLE OF WATER IN AGRICULTURE),
James A. Taylor.
Symposium. xxii..230p. Illus. Pergamon Press Ltd.: Oxford, England; Elmsford, N, Y., USA. 1970. Pr. $7.40.
Identifiers: Agriculture, Book, Erosion, Fruit, Management, Rainfall, Resource, Soil, Symposium, Vegetables, Water.

This volume which focuses on the role of water in British agriculture is based on 13 papers and discussions emerging from the 12th symposium in the Aberystwyth series at the University College of Wales in agricultural meteorology. The meeting, held at the Welsh Plant Breeding Station March 19, 1969, was attended by delegates from the fields of hydrology, geography, meteorology, engineering, applied biology, agriculture, pedology and plant physiology. Topics reflect on a concern with the

study of water as an available resource for agricultural production. The 1st 4 selections deal with the problem of accurate rainfall measurement and its significance for agriculture, a survey of the sources of error in agricultural water budgets and progress reports on 2 catchment studies, (the water balance of a small clay catchment and the variation in sediment yields from catchments in eastern Yorkshire). The next contribution deals with sediment yields on an international basis from forested and agricultural lands and with the problem of soil erosion in Britain. Other papers report work on the effect of agricultural treatments on water availability in the soil and current trends in the varied uses of water for agriculture including intensification of irrigation for high value crops such as vegetables and fruit. The water requirements of particular stock-producing systems is discussed mentioning intensive housing of animals. A study of water resource management and the needs of agriculture is included along with 2 chapters on irrigation (cumulative effects registered in fruit crops in England). The final papers shows how conventional water balance sheets can be used for long-term as well as short-term irrigation needs and the role of the water factor in land use planning. An edited report of the discussions is given to conclude the volume and is followed by some general conclusions and their implications. The book may be of use in conjunction with courses in biogeography, climatology, agricultural science, environmental science and ecology as well as being of interest to the agricultural research student. Selected papers will be indexed in BIORESEARCH INDEX.--Copyright 1971, Biological Abstracts, Inc.
W71-12534

EFFECT OF SOIL MOISTURE ON THE WATER SYSTEM OF PEACH,
For primary bibliographic entry see Field 02G.
W71-12535

EFFECTS OF WEED CONTROL METHODS ON SWEET CORN,
Agricultural Research Service, Beltsville, Md. Crops Resource Div.
L. L. Danielson.
Weed Science. 18 (6): 707-710. Illus. 1970 (recd. 1971).
Identifiers: Atrazine, Control, Corn-M, Growth, Irrigation, Methods, Root, Sweet, Weed, Yield, Zea-Mays-Var-Rugosa-M.

Three tractor cultivations that severely pruned the root systems of hand-weeded plots of sweet corn (Zea mays L. var. rugosa Bonaf., Iochief) grown on a Codorus-Elkton silt loam under extreme drought conditions did not reduce the yield of marketable ears when irrigation totalling 2 acre-in was applied during pollination and ear-filling. Preemergence application of 2-chloro-4- (ethylamino)-6-(isopropylamino)-s-triazine (atrazine) to the soil surface without cultivation reduced brace root growth and yields significantly in the year of most severe drought. These effects of atrazine were avoided when the herbicide treatments were supplemented with tractor cultivations that covered the brace root zone of the corn plants with soil.--Copyright 1971, Biological Abstracts, Inc.
W71-12536

SPECIFIC GRAVITY, POTATO CHIP COLOR AND TUBER MINERAL CONTENT AS AFFECTED BY SOIL MOISTURE AND HARVEST DATES,
Kansas Agricultural Experiment Station Manhattan. Dept. of Horticultural Forestry.
J. E. Motes, and J. K. Greig.
Amer Potato J. 47 (11): 413-418. Illus. 1970.
Identifiers: Chip, Color, Dates, Gravity, Harvest, Irrigation, Mineral, Moisture, Potato-D, Soil, Temperature, Tuber.

In 1966 and 1967 the chipping quality of 3 potato cultivars was studied using 3 moisture regumes, 2 N levels and 3 harvest dates. Specific gravity and chip color of potatoes freshly harvested and of those stored 10 days, along with chip color differences between the 2 periods, were tested. Of the 3 cultivars tested, Anoka, Kennebec, Irish Cobbler, Anoka's specific gravity was least depressed by soil-moisture stress and its chip color least affected by time of chipping; all tubers, however, chipped darker after being stored. High soil temeratures were associated with low specific gravities and dark chips. In 1966 irrigation tended to lower soil temperature, resulting in lighter chip color for potatoes harvested from irrigated than from non-irrigated plots; also color was lighter at the 1st than at the later harvests. In 1967, when air temperatures were consistently lower and rainfall nearly adequate, chip color was lighter for potatoes harvested later in the season. N levels did not influence chip color. Moisture regims and varieties influenced mineral content of tubers more consistently for the 2 yr than did harvest dates or N levels. Specific gravity did not correlate significantly with chip color.--Copyright 1971, Biological Abstracts, Inc.
W71-12537

SOIL PHYSICAL INVESTIGATIONS IN GREENHOUSE CROPS IN SCANIA 1965-1968, (M SWEDISH),
Institutionen for Koksvaxt- och Prydnadsvaxtodling, Alnarp (Sweden).
For primary bibliographic entry see Field 02G.
W71-12538

RESPONSES OF STOMATA OF BARLEY AND MAIZE TO PHENYLMERCURIC ACETATE,
Lancaster Univ., Bailrigg (England). Dept. of Biological Sciences.
For primary bibliographic entry see Field 02I.
W71-12559

WATER STORAGE AND ALFALFA PRODUCTION ON LEVEL BENCHES IN THE NORTHERN PLAINS,
Agricultural Research Service, Mandan, N.Dak. Northern Great Plains Research Center.
H. J. Hass, and W. O. Willis.
Journal of Soil and Water Conservation, Vol 26, No 4, p 151-154, July-August 1971. 5 fig, 2 tab, 9 ref.

Descriptors: *Snow management, *Water storage, *Water conservation, *Great Plains, Terracing, Flood control, Water yield, Snowpacks, Land management, Grasslands, Comsumptive use, Alfalfa, Soil-water-plant relationships, Evapotranspiration.
Identifiers: Northern Great Plains.

Level benches effectively collected snow, conserved water, and increased alfalfa yields in a 5-year study. Water storage and alfalfa yields were influenced more by a bench's favorable location for snow collection than by size of the contributing area. Water storage overwinter averaged 1.4 inches on the slope and ranged from 4.8 to 9.1 inches on the benches. Alfalfa production averaged 1.50 tons per acre on the slope and ranged from 3.20 to 4.28 tons per acre on the benches. (Knapp-USGS)
W71-12598

AGRICULTURE IN THE SEVEN-STREAM LAND (ILI-BALKHASH BASIN) OF SOUTHERN KAZAKHSTAN-AGROCLIMATIC CONDITIONS, DEVELOPMENT AND SITUATION (Die Agrarwirtschaft des Siebenstromlandes in Suedkazachstan, Agroklimatische Ausstattung, Entwicklung und Stand),
E. Giese.
Die Erde, Vol 101, No 2, p 92-122, 1970. 8 fig, 5 tab, 54 ref.

Descriptors: *Arid lands, *Irrigation practices, *Cereal crops, *Grazing, *Social aspects, History, Migrations, Political aspects, Geographical regions, Climatic data, Topography, Regional analysis, Land use.
Identifiers: *U.S.S.R., *Kazakhstan, *Nomadism, *Agroclimatology.

The geography of the Ili-Balkhash Basin may be taken as representative of the Tien-Shan foothill areas of southern Kazakhstan. Because of the latitude and topography, the climate of the region is characterized by long, cold winters and hot, dry summers, so that most of the region is desert or semidesert. Intensive agriculture, practiced in only about 6% of the region, is concentrated in a 10-15 km rim along the mountain range. In contrast to the lowland region, the nearby mountain areas experience high rainfall, and even though 38% of the cropland is irrigated, only about 32% of mountain runoff is utilized. A complicating factor is the occurrence of frosts during the late spring, which limit agriculture mainly to cereal crops, even though further irrigation development is possible. Historically, pastoral nomads populated the region, and agriculture was limited by intertribal warfare. Russian immigration into the area in the 19th century brought crop agriculture and the diminution of cattle herds. Soviet collectivization in the 1920's further resulted in lessening of agricultural productivity. A rebuilding phase began in the 1950's, and is described in detail. (Casey-Arizona)
W71-12736

RELATIONSHIP BETWEEN PLANT HEIGHT AND TRANSPIRATION IN COTTON (GOSSYPIUM HIRSUTUM L.),
Texas a and M Univ, Center, Lubbock.
C. W. Wendt.
Botanical Gazette, Vol 132, No 1, p 1-3, March 1971. 1 fig, 1 tab, 3 ref.

Descriptors: *Cotton, *Transpiration, *Plant growth, *Crop production, Leaves, Seeds, Varieties, Correlation analysis, Laboratory tests, *Regression analysis.
Identifiers: *Stems, *Plant height.

Previous investigations indicate that stem elongation in cotton decreases as transpiration decreases. In order to determine whether a definite relation exists between stem growth and transpiration, 5 varieties of G. hirsutum (C A 491, Acala 1517 BR-2, Lankart 57, Paymaster 111 and Stoneville 7-A) were pot grown through the boll stage. The results were fitted to a regression of transpiration on plant height using the equation: log Y — a .. b log X. All intercepts were equal, but the slopes of 3 varieties were different (95% level), indicating they transpired significantly more water per unit height than did the other 2 varieties. Correlation coefficients ranged from 0.93 - 0.98. It is cautioned that transpiration under these experimental conditions may have little relationship to transpiration by the same plants under field conditions. (Casey-Arizona)
W71-12739

BIOTIC INFLUENCES ON AUSTRALIAN PASTORAL LAND USE,
California Univ., Los Angeles. Dept. of Geography.
Tom L. McKnight.
Association of Pacific Coast Geographers, Yearbook, Vol 32, p 7-22, 1970. 7 fig, 1 tab, 10 ref.

Descriptors: *Land use, *Environmental effects, *Grazing, *Sheep, *Cattle, Vegetation effects, Predation, Water holes, Water supply, Arid lands, Economic feasibility, Geographical regions, Climate, Topography, Animal populations, Transportation, Range management.
Identifiers: *Australia, *Barrier fences.

Some 44% of Australia's export earnings are through the sale of livestock products, with wool ranking first. Of the 6 kinds of Australian livestock enterprises, this paper focuses on extensive cattle raising and extensive sheep raising. While these 2 forms of pastoralism utilize vast land areas, the regions of overlap are minimal, although the reasons for this are not well understood. Unlike the U.S., sheep are normally favored over cattle, and when possible the better lands go to them. The physical

factors of climate, topography and water availability probably are marginally influenced in some areas, but are less important than the biotic factors. Plant palatability and toxicity factors are probably limiting only in the wetter north and northeast. Sheep are far more subject to predation than cattle, a fact which has been widely exploited by the dingo. There are numerous reports of shocking mortality fates from dingo predation. Although a vast national effort is concentrated on eliminating this wild dog, it persists, and continues to exercise its own special form of land use determinism. This has led to the unique barrier fences, stretching as far, continuously, as 5,300 miles. These are designed to exclude dingos from vast rangelands. It is concluded that the dingo is the major sheep-raising inhibitor and the major boundaries between sheep and cattle areas are the dingo barrier fences. (Casey-Arizona)
W71-12744

WATER MOVEMENT IN LARGE SOIL PORES: VALIDITY AND UTILITY OF THE CHANNEL SYSTEM CONCEPT,
Wisconsin Univ, Madison; and Agricultural Research Service, Renv. Nev.
For primary bibliographic entry see Field 02G.
W71-12754

VARIOUS ESTIMATES OF THE EFFECT OF AGRICULTURE ON RUNOFF,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 04C.
W71-12815

OPERATION AND MAINTENANCE OF COLORADO RIVER AQUEDUCT,
Metropolitan Water District of Southern California, Los Angeles.
For primary bibliographic entry see Field 08C.
W71-12888

PUBLIC IRRIGATION SYSTEMS IN PUERTO RICO,
Puerto Rico Water Resources Authority, San Juan.
For primary bibliographic entry see Field 04A.
W71-12889

TROPICAL AQUACULTURE IN HONG KONG,
California Univ., Riverside.
For primary bibliographic entry see Field 02L.
W71-12916

A PSYCHROMETRIC APPROACH TO SCHEDULE IRRIGATION,
Puerto Rico Univ., Rio Piedras. Agricultural Experiment Station.
For primary bibliographic entry see Field 02D.
W71-12940

PLASTICS WHICH ARE SAFE FROM 'ODENTS,
Steiniger.
:sundheitsw Desinfek. 60 (11): 154-158. Illus. 968.
.dentifiers: Plastics, Rodents.

The damage caused by rodents has been observed in plastic tarpaulins used for covering fields in agricultural and technical set-ups, supply pipes and electrical conduction wires. Factors influencing this behavior and their consideration in the use of poison baits are discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12949

MELIORATIVE MEASURES IN ASSIMILATION OF SECTIONS OF IRRIGATION IN THE IRTYSH-KARAGANDA CANAL,
G. A. Safonov.
Izv Akad Nauk Kaz Ssr Ser Biol. 3. 1-7. 1970.
Identifiers: Assimilation, Canal, Irrigation, Irtysh, Karaganda, Measures, Meliorative, Sections, USSR.

The territory along the Irtysh-Karaganda Canal, USSR, was divided into 4 sections and irrigated. Better irrigation measures were given on the basis of the results of the irrigation of these sections, either prospective or unfavorable for irrigation.--Copyright 1971, Biological Abstracts, Inc.
W71-12958

ADVANCES IN AGRONOMY, VOL. 22,
N. C. Brady.
462 p. Illus. Academic Press, Inc.: New York, N. Y., 1970. Pr. $21.00.
Identifiers: Agronomy, Book.

In keeping with one of the basic objectives of this series prepared under the auspices of the American Society of Agronomy, this volume covers a variety of subjects of concern to crop and soil scientists. The 16 contributors from North America and Australia have contributed papers representing the current attention to tropical agriculture: an analysis is provided on the potential and problems of ratoon cropping with tropical crops such as bananas, sugar cane and pineapples; a review is included of research to improve tropical pastures related to the potential for forage production in the tropics, emphasizing the problem involved in the production and utilization of important tropical forage species. Two other chapters relate to the animal industry as well as crop production: a review of research on birdsfoot trefoil (Lotus corniculatus L.), an important pasture and forage legume of value in the North Central and Northeastern states; and information on grass tetany, a ruminant animal malady associated with forages low in Mg and relatively high in N and K; factors affecting the animal disorders, probable reasons for them and therapeutic techniques are reviewed. A paper on frost and chilling damage to plants includes evidence as to the mechanism of damage and information on methods of preventing or reducing this damage; another chapter comments on the relationship of geometric figuration of roots to nutrient uptake. Research is reviewed which identifies the conditions under which nutrient transfer in the soil and root system configuration limit nutrient uptake. A consideration of the part the soil might play as a sink for various kinds of wastes is also included for pesticides and other exotic chemicals, sewage and similar wastes; one chapter is addressed to reaction of soils (clays) with organic compounds. The soil environment for plant roots and other living organisms is considered in 2 chapters. The use of Pt electrode methods for measuring soil aeration is covered. A final chapter discussed the microflora of grasslands and grassland soils.--Copyright 1971, Biological Abstracts, Inc.
W71-12963

THE RESPONSE OF BLACK CURRANTS TO DIFFERENT SOIL MOISTURE CONDITIONS AND TWO LEVELS OF NITROGENOUS FERTILIZER,
East Malling Research Station, Maidstone (England).
J. E. Goode, and K. J. Hyrycz.
J Hort Sci. 45 (4): 379-391. Illus. 1970.
Identifiers: Berry, Black, Currants-D, Fertilizer, Growth, Moisture, Nitrogenous, Phosphorus, Pruning, Ripening, Soil, Yield.

Two-year-old black currant bushes (cultivar 'Amos Black'), planted in Nov. 1956 on a freely drained fine sandy loam soil, were used to study growth and crop responses to 3 watering treatments and 2 levels of N fertilizer, using 6 replications of plots containing 12 bushes each. In each unit plot 1/2 the bushes were left unpruned. Water was applied in treatments (a) and (b) when soil moisture tensiometers set 1 ft (0.3 m) deep indicated tensions of 20 cm Hg and 50 cm Hg respectively. In the 3rd treatment (c) the bushes were not watered. The N fertilizer rates were 70 lb/acre (78 kg/ha) and 140 lb/acre (157 kg/ha). Irrigation increased shoot growth even in relatively wet seasons, and the crop increases achieved by irrigation became progressively larger each year irrespective of the level of cropping of the unwatered bushes, which reached 6.5 tons/acre (14.6 tons/ha) in 1961. The average yield increase was about 60% from the unpruned and 50% from the pruned bushes. In the last year of the experiment the crop yield response to irrigation was 124% on the unpruned and 80% on the pruned bushes. These increases were mainly the result of increased shoot growth, but irrigation also increased berry production per sprig (raceme) and berry size. Although pruning reduced the response to irrigation, it showed advantages, compared with no pruning, in the form of more even ripening of berries, easier picking and larger berries, and, in the normal course of events, it would prolong the life of a uniform cropping plantation. There was no difference between the effects of N treatments on the growth or cropping of watered or unwatered bushes. The higher rate of N application increased leaf N but depressed leaf P, the latter effect being more marked in the irrigated bushes.--Copyright 1971, Biological Abstracts, Inc.
W71-12964

GROWTH AND PRODUCTIVITY OF TAPIOCA (MANIHOT UTILISSIMA): II. STOMATAL FUNCTIONING AND YIELD,
Malaya Univ., Kuala Lumpur (Malaysia).
C. N. Williams.
Exp Agr. 7 (1): 49-62. Illus. 1971.
Identifiers: Canopy, Conductivity, Falling, Functioning, Growth, Leaf, Manihot-Utilissima-D, Moisture, Planting, Porometer, Pressure, Productivity, Stomatal, Stress, Tapioca-D, Yield.

The stomatal functioning of high, medium and low yielding clones of tapioca was examined to see whether yield could be associated with conductivity and/or resistance to moisture stress. A sensitive falling pressure porometer was used to measure stomatal conductivity to the viscous flow of air at small pressure differences. No marked differences were observed which could account for the large range in yields shown by the varieties, but stomatal functioning could be related to canopy type and to planting conditions. In general, the conductivity values of all 3 varieties were very low compared to many other crop species, which suggests that increases in canopy efficiency and yield could be obtained in certain environments by an increase in leaf conductivity.--Copyright 1971, Biological Abstracts, Inc.
W71-12965

EFFECTS OF SOIL MOISTURE REGIMES ON LEAF WATER DEFICIT, TRANSPIRATION AND YIELD OF TOMATOES,
Scottish Horticultural Research Inst., Dundee.
For primary bibliographic entry see Field 02D.
W71-12966

ACQUISITION AND DISTRIBUTION OF NEMATODES IN IRRIGATION WATERWAYS OF THE COLUMBIA BASIN IN EASTERN WASHINGTON,
Washington State Univ., Prosser. Irrigation Agricultural Research and Extension Center.
L. R. Faulkner, and W. J. Bolander.
J Nematol. 2 (4): 362-367. Illus. 1970.
Identifiers: Acquisition, Basin, Columbia, Distribution, Eastern, Irrigation, Nematodes, Parasitic, Plant, USA, Washington, Waterways.

The primary source of plant parasitic nematodes in irrigation waterways in the Columbia Basin Project of eastern Washington (USA) is irrigation runoff returned into the irrigation system. This has contributed to the rapid spread of plant parasitic nematodes observed during 8 yr of study.--Copyright 1971, Biological Abstracts, Inc.
W71-12970

HERBICIDES IN IRRIGATION WATER FOLLOWING CANAL-BANK TREATMENT FOR WEED CONTROL,
Agricultural Research Service, Denver, Colo. Research Div.
For primary bibliographic entry see Field 04A.
W71-12980

SOAKING INJURY IN LIMA BEANS,
Agricultural Research Service, Fort Collins, Colo. Seed Storage Lab.
For primary bibliographic entry see Field 02I.
W71-12981

EFFECT OF WATER SUPPLY ON SOME PHYSIOLOGICAL PROCESSES AND PRODUCTIVITY OF FINE-FIBERED COTTON,
N. Durdyev.
Izv Akad Nauk Turkm Ssr Ser Biol Nauk. 5. 15-21. 1970. (Eng. Summ.).
Identifiers: Cotton-D, Fibered, Fine, Physiological, Processes, Productivity, Protein, Synthesis, Water.

The moisture requirements of fine-fibered cotton '8763H' are low at the early periods of development. A slight moisture deficit at that period promotes a high intensity of physiological processes. The increase of soil drought at the flowering stage strongly inhibits the synthesis of protein, organic P compounds and carbohydrates. It delays the flow of nutrients to fruit-forming organs and thus reduces crop productivity.--Copyright 1971, Biological Abstracts, Inc.
W71-13007

YIELD COMPONENTS AND LEAF CHARACTERISTICS ASSOCIATED WITH THE WATER REQUIREMENTS OF ALFALFA,
Arizona Univ., Tucson. Dept. of Agronomy.
A. K. Dobrenz, D. F. Cole, and M. A. Massengale.
Crop Sci. 11 (1): 124-125. Illus. 1971.
Identifiers: Alfalfa-D, Cell, Components, Density, Leaf, Medicago-Sativa-D, Palisade, Petiole, Stem, Transpiration, Water, Weight, Yield.

Five cultivars and 2 experimental lines of alfalfa (Medicago sativa L.) displayed significant differences in the grams of water required to produce a gram of dry matter under controlled environment conditions. Stem and petiole weight, leaflet weight, total forage dry weight, and leaf area were all significantly associated with the water requirement of alfalfa. Leaf thickness and palisade cell density were not associated with water requirement or total transpired water, but did differ significantly among cultivars.--Copyright 1971, Biological Abstracts, Inc.
W71-13008

SOME ASPECTS OF THE NITROGEN: WATER INTERACTION ON GRASS SWARDS,
Foras Taluntais, Cork (Ireland).
P. C. McFeely, and R. S. Tayler.
J Brit Grassl Soc. 25 (4): 261-265. 1970.
Identifiers: Grass-M, Interaction, Irrigation, Nitrogen, Rye, Swards, Water.

Experiments were conducted on ryegrass swards using different amounts of N fertilizer applied as a single early dressing (S) or in repeated applications during the season (R). Over 3 yr, the yield from R was generally higher, but under dry conditions (using plot covers) S gave the greater yield. The latter result is ascribed to the high yield obtained from S at the 1st cut, at which time N uptake was not limited by a lack of soil water. Irrigation at less than the full requirement resulted in lower total yields but it increased water-use efficiency by up to 70% (R) and 94% (S).--Copyright 1971, Biological Abstracts, Inc.
W71-13009

NUTRITIONAL INVESTIGATIONS IN IRRIGATED MAIZE ON SOME BLACK EARTH SOILS, DARLING DOWNS, QUEENSLAND,
Queensland Wheat Research Inst., Toowoomba (Australia). Primary Industries Dept.
D. E. Hibberd, R. B. Brinsmead, and J. W. Littler.
Queensl J Agr Anim Sci. 27 (2): 177-182. 1970.
Identifiers: Australia, Black, Darling, Downs, Earth, Grain, Irrigated, Maize-M, Nutritional, Queensland, Soils, Yield.

A number of nutrients suspected of being deficient were applied singly and in selected combinations in field trials. Significant grain yield responses were obtained only to N, and in one locality to P. Zinc gave a nonsignificant yield increase in one trial. However, a temporary Zn unavailability may occur sporadically on irrigated country. Applications of K, Mn, B, Mo and Fe did not have any effect on plant foliage or grain yields. Full benefit from N applications and high maize yields may not be realized if waterlogging occurs after irrigation. In phosphate-deficient areas, N and P are required in combination to secure highest yields.--Copyright 1971, Biological Abstracts, Inc.
W71-13010

PERFORMANCE OF GRAIN SORGHUM STRAINS UNDER IRRIGATION ON THE DARLING DOWNS AND IN NEAR SOUTHWESTERN QUEENSLAND,
Queensland Wheat Research Inst., Toowoomba (Australia). Primary Industries Dept.
R. B. Brinsmead, R. F. Moore, N. E. Delaney, and J. L. Gunton.
Queensl J Agr Anim Sci. 27 (2): 199-202. 1970.
Identifiers: Australia, Darling, Downs, Grain, Irrigation, Performance, Queensland, Sorghum-M, Southwestern, Strains, Under, Yield.

Later maturing grain sorghum strains (e. g. 'Texas 671,' 'DeKalb E57,' 'Pioneer 846' and 'NK 310') grown under irrigation failed to show any marked yield advantage over the earlier maturing 'Texas 610,' 'Texas 626' and 'NK 212' strains. All hybrids generally were significantly better than the open-pollinated 'Alpha.' Grain nitrogen percentage showed a wide variation but on average little difference between strains was noted.--Copyright 1971, Biological Abstracts, Inc.
W71-13011

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

FLOOD FREQUENCY ESTIMATING TECHNIQUES FOR SMALL WATERSHEDS,
Hydrocomp International, Palo Alto, Calif.
For primary bibliographic entry see Field 02E.
W71-12261

FLOOD PLAIN INFORMATION--COASTAL FLOODING, TOWN OF WACHAPREAGUE, VIRGINIA.
Corps of Engineers, Norfolk, Va.

Army Corps of Engineers Flood Plain Report, March 1971. 40 p, 7 fig, 8 plate, 4 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge, Atlantic Ocean, Hurricanes, Wind tides, Estuaries, Bays.
Identifiers: *Floods (Wachapreague, Va.), Standard Project Flood, Intermediate Regional Flood.

The flood situation at and in the vicinity of the town of Wachapreague, Virginia is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. (Woodard-USGS)
W71-12287

FLOOD PLAIN INFORMATION, CALFKILLER RIVER, SPARTA, TENNESSEE.
Corps of Engineers, Nashville, Tenn.

Army Corps of Engineers Flood Plain Report, April 1971. 37 p, 9 fig, 7 plate, 8 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Tennessee, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge.
Identifiers: *Floods (Sparta, Tenn.), Standard Project Flood, Intermediate Regional Flood.

The flood situation along Calfkiller River in the vicinity of Sparta, Tennessee is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The greatest flood known on Calfkiller River since 1902 occurred on Mar. 24, 1929. The flood crested at 26.5 feet. The Intermediate Regional Flood at Sparta would be about 1.5 feet higher than the March 1929 flood. Duration of floods is relatively short on Calfkiller River in the vicinity of Sparta. During the March 1929 flood, the river remained out of banks for about 48 hours. A Standard Project Flood would remain out of banks for about 76 hours. (Woodard-USGS)
W71-12288

PRELIMINARY FLOOD--FREQUENCY RELATIONS AND SUMMARY OF MAXIMUM DISCHARGES IN NEW MEXICO--A PROGRESS REPORT,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 02E.
W71-12290

FLOOD PLAIN INFORMATION, McDOWELL COUNTY, NORTH CAROLINA--VOLUME 1. CATAWBA RIVER AND MILL CREEK.
Corps of Engineers, Charleston, S.C.

Army Corps of Engineers Flood Plain Report, June 1971. 62 p, 22 fig, 17 plate, 13 tab.

Descriptors: *Floods, *Flood drainage, *Flood plains, *North Carolina, Regional flood, Flood forecasting, Flood control, Design flood, Peak discharge, Historic flood.
Identifiers: *Floods (McDowell Co., N.C.), *Catawba River (North Carolina), Standard project flood, Intermediate Regional Flood.

Flooding along Catawba River and Mill Creek in McDowell County, North Carolina is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The greatest flood known to have occurred in McDowell County was the flood of July 1916. The 1916 flood reached stages approximately equal to those which would occur during a Standard Project Flood. The Standard Project Flood peak discharge is about 105,510 cfs for Catawba River at River Mile 293.1 (drainage area 176.0 sq. mi.) and 18,985 cfs for Mill Creek at River Mile 0.0 (drainage area 21.8 sq. mi.). (Woodard-USGS)
W71-12293

FLOOD PLAIN INFORMATION, UMATILLA RIVER TRIBUTARIES, McKAY, TUTUILLA AND WILDHORSE CREEKS, PENDLETON, OREGON AND VICINITY.
Army Engineer District, Walla Walla, Wash.

Army Corps of Engineers Flood Plain Report, March 1971. 44 p, 13 fig, 22 plate, 4 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Oregon, Regional flood, Flood forecasting, Flood control, Peak discharge, Historic flood.
Identifiers: Standard Project Flood, Intermediate Regional Flood.

Flooding along the Umatilla River Tributaries in Pendleton, Oregon and vicinity is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. Flood plain areas described are the bottom lands along the downstream reaches of McKay, Tutuilla, and Wildhorse Creeks. Overflows and damages in the flood plain begin with flows of about 900 cfs on McKay Creek, 2,000 cfs on Tutuilla Creek below Pataha Creek, and 5,000 cfs on Wildhorse Creek. The discharge for the Intermediate Regional Flood would be 4,000 cfs on McKay Creek, 3,400 cfs on Tutuilla Creek, and 9,600 cfs on Wildhorse Creek. Discharge for the Standard Project Flood could be 15,300 cfs for McKay Creek, 6,700 cfs to Tutuilla Creek, and 16,000 cfs for Wildhorse Creek. (Woodard-USGS)
W71-12294

STOCHASTIC OPTIMIZATION AND SIMULATION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS (VOLUME I), INTRODUCTION.
Texas Water Development Board, Austin, Texas; and Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 06A.
W71-12325

STOCHASTIC OPTIMIZATION AND SIMULATION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS (VOLUME II), (PROGRAM DESCRIPTIONS).
Texas Water Development Board, Austin, Texas; and Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 06A.
W71-12326

STOCHASTIC OPTIMIZATION AND SIMULATION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS (VOLUME III), DATA MANAGEMENT AND ANALYSIS PROGRAM DESCRIPTION.
Texas Water Development Board, Austin, Texas; and Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 06A.
W71-12327

FLOOD PLAIN INFORMATION, MUD LICK CREEK AT ROANOKE, VIRGINIA.
Corps of Engineers, Wilmington, N.C.

Army Corps of Engineers Flood Plain Report, February 1971. 25 p, 5 fig, 9 plate, 7 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Virginia, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge.
Identifiers: *Floods (Roanoke-Va), Standard project flood, Intermediate regional flood.

Flooding along Mud Lick Creek from its confluence with Roanoke River to Virginia State Road 1662 (mile 4.18) is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. Past floods have occurred at an estimated rate of nearly one every 3 years. Most of these floods would be considered relatively minor in nature at the present time, but with increasing development in the flood plain, a significant increase in flood damages would result. Depending upon the location within the study area, the Intermediate Regional Flood ranges from 2 to 10 feet higher than bankfull stage and the Standard Project Flood from 6 to 25 feet higher. (Woodard-USGS)
W71-12361

FLOOD PLAIN INFORMATION OF SAN MARCOS CREEK, VICINITY OF SAN MARCOS, SAN DIEGO COUNTY, CALIFORNIA.
Corps of Engineers, Los Angeles, Calif.

Army Corps of Engineers Flood Plain Report, April 1971. 30 p, 20 fig, 29 plate, 5 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *California, Regional flood, Flood forecasting, Flood control, Peak discharge.
Identifiers: Standard project flood, Intermediate regional flood.

Flooding along San Marcos Creek in San Diego County, California, is described to aid in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. For the San Marcos Creek at the mouth, the estimated discharge for the Intermediate Regional Flood is 15,000 cfs and the standard project flood is 23,000 cfs. (Woodard-USGS)
W71-12362

FORECASTING THE SPRING HIGH-WATER HYDROGRAPH OF FLOOD-PLAIN RIVERS, TAKING THE DESNA RIVER AS AN EXAMPLE,
Gidrometeorologicheskii Institut, Odessa (USSR).
I. A. Popova.
Translated from Meteorology, Climatology and Hydrology (Meteorologiya, klimatologiya i gidrologiya), No. 5, 1969, pp. 201-207. Soviet Hydrology: Selected Papers, No 6, p 585-588, 1969. 4 p, 2 fig, 2 tab, 5 ref.

Descriptors: *Streamflow forecasting, *Routing, *Flood forecasting, *Peak discharge, Hydrograph analysis, Flood plains, Recession curves, Hydrographs, Low flow, Time lag.
Identifiers: *Hydrograph forecasting, *USSR, *Desna River.

One of the most complicated hydrologic forecasts is that of the spring high-water hydrograph. Two methods are presently available in the USSR for solving this problem. (1) Computation of the flow hydrograph from volume curves. Construction of homogeneous volume curves for large river systems requires special topographic materials. Their lack interfers with the use of this method. (2) Computation of the hydrograph from the genetic flow formula using the basin area, the channel traveltime curve, and the total water inflow into the river network. The possibility of computing and forecasting the high-water hydrograph of the Desna River with allowance for flood transformation by the flood plain is discussed. The basin is 65% waterlogged. The Desna valley has a well developed system of flood-plain lakes, oxbow lakes and arms. The total duration of high water at Chernigov is about 100 days, flood recession being 1.5-2 times longer than the flood rise. When the flood plain is approximately half filled, flow velocity increases sharply and the distribution of total inflow yields the traveltime function. The computation method described can be used to forecast the high-water hydrograph from the known predicted total inflow. The inflow into the Desna River is forecast from a typical inflow decrease curve. The earliest date on which the forecast is released is the date of the total inflow maximum. The maximum range of the forecast is about two months and the maximum range of the forecast of the discharge maximum is 20 to 25 days. (Knapp-USGS)
W71-12398

ANALYTICAL RELATIONS IN THE TIME FREQUENCY OF THE TOTAL RIVER RUNOFF AND ITS GENETIC COMPONENTS,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
For primary bibliographic entry see Field 02E.
W71-12424

OVERLAND FLOW ON RANGELAND WATERSHEDS,
Agricultural Research Service, Fort Collings, Colo. and Agricultural Research Service, Rapid City, S. Dak.
For primary bibliographic entry see Field 02E.
W71-12432

A NOTE ON THE USE OF MARKOV CHAINS IN HYDROLOGY,
Lancaster Univ. Bailrigg (England). Dept. of Mathematics.
G. G. S. Pegram.
Journal of Hydrology, Vol 13, No 3, p 216-230, July 1971. 12 ref.

Descriptors: *Markov processes, *Runoff forecasting, *Reservoir design, *Reservoir operation, Mathematical models, Probability, Variability, Routing, Streamflow forecasting, Stochastic processes, Flood control.

Some aspects of transition probability matrices as used in Markov chains are discussed with particular reference to their roles in Stochastic Reservoir and Flood Cascade Theories. By rationalizing the approach to multivariate Markov chains, complicated problems can be dealt with in a unified manner. Sums of Markov chains are themselves Markovian, which facilitates dealing with systems of more than one reservoir. A flood cascade model is developed to allow probabilistic comparisons to be made of the flood attenuation capabilities of various dam layouts. (Knapp-USGS).
W71-12461

CONTRIBUTIONS TO THE DETERMINATION OF THE LIMIT FOR MAIZE CULTURE ON SLOPE GROUNDS,
For primary bibliographic entry see Field 03F.
W71-12477

CONTRIBUTIONS TO THE DETERMINATION OF AGROTECHNICS ON SLOPE GROUNDS (IN RUMANIA),
Ministerul Agriculturii si Silviculturii, Podu-Iloaie (Rumania). Agricultura Experiment Station.
For primary bibliographic entry see Field 03F.
W71-12478

WATER HAULING BY TRUCKS IN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 06D.
W71-12584

FLOOD PLAIN INFORMATION, MONUMENT CREEK, COLORADO SPRINGS, COLORADO.
Corps of Engineers, Albuquerque, N.Mex.

Army Corps of Engineers Flood Plain Report, May 1971. 42 p, 9 fig, 13 plate, 6 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Colorado, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge.
Identifiers: *Floods (Colorado Springs, Colo), Standard Project Flood, Intermediate Regional Flood.

Flooding along Monument Creek in the vicinity of Colorado Springs, Colorado is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The May 1935 flood, with an estimated peak discahrge of 50,000 cfs, is the greatest flood of record on Monument Creek. This flood was greater than the Intermediate Regional Flood magnitude, and its peak discharge approached that of the Standard Project Flood (63,400 cfs). (Woodard-USGS)
W71-12667

FLOOD PLAIN INFORMATION, LODGEPOLE CREEK, SIDNEY, NEBRASKA.
Corps of Engineers, Omaha, Nebr.

Army Corps of Engineers Flood Plain Report, May 1971. 22 p, 4 plate, 3 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Nebraska, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge.
Identifiers: *Floods (Sidney, Neb), Standard Project Flood, Intermediate Regional Flood.

Flooding along Lodgepole Creek at Sidney, Nebraska is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The reach of Lodgepole Creek studied extends from a county road approximately 0.5 mile upstream from the west city limits to a county road about 0.6 mile downstream from the east city limits. The channel slope within this reach is 8 feet per mile, much flatter than the valley slope, due to meandering. The channel cross section varies considerably in the study reach but is generally 5 to 8 feet deep an0 feet wide. (Woodard-USGS)
W71-12668

RIVER ICEBREAKER: CONCEPT DESIGN AND TESTING.
CONSULTEC, Inc., Rockville, Md.
For primary bibliographic entry see Field 02C.
W71-12706

CONTRIBUTION TO THE AUTECOLOGY OF URGINEA MARITIMA IN EGYPT,
Cairo Univ. (Egypt), Faculty of Science; and Chemical Industries Development Co., Cario (Egypt).
For primary bibliographic entry see Field 02I.
W71-12748

WATERMOVEMENT IN LARGE SOIL PORES: A CHANNEL SYSTEM CONCEPT OF INFILTRATION,
Agricultural Research Service; Reno, Nev; and Wisconsin Univ; Madison.
For primary bibliographic entry see Field 02G.
W71-12753

TEXAS 'LOST PINES' NOT SUPERIOR ON DRY SITES IN NORTHERN MISSISSIPPI,
Southern Forest Experiment Station, Oxford, Miss.
B. P. Dickerson.
USDA Forest Serv. Res. Note SO-119, 4 p. 1971.

Descriptors: *Vegetation establishment, *Erosion control, *Reforestation, *Drought resistance, *Loblolly pine trees, Soil stablization, Watershed management, Soil conservation, Planting management, Texas, Mississippi.
Identifiers: *Species adaptability, Droughty site.

'Lost Pines' from two Texas sources failed to surpass loblolly pines from Mississippi and Alabama in survival or growth when planted for 3 successive years on eroded droughty sites in northern Mississippi.
W71-12756

FLOOD PLAIN INFORMATION, CLINTON COUNTY, PENNSYLVANIA, WEST BRANCH SUSQUEHANNA RIVER AND BALD EAGLE CREEK (LOCK HAVEN AREA).
Corps of Engineers, Baltimore, Md.

Army Corps of Engineers Flood Plain Report, March 1971. 37 p, 3 fig, 13 plate, 10 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Pennsylvania, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge.
Identifiers: *Clinton County (Pa), *West Branch Susquehanna River (Pa), *Bald Eagle Creek (Pa), Standard Project Flood, Intermediate Regional Flood.

The flood situation along the West Branch Susquehanna River and North Bald Eagle Creek in the Lock Haven area of Clinton County, Pennsylvania is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The greatest known flood on the West Branch Susquehanna River at Lock Haven had an estimated peak discharge of 238,000 cfs on March 18, 1936. The Standard Project Flood on the West Branch Susquehanna River at river mile 66.77 would have an estimated peak discharge of 325,000 cfs. (Woodard-USGS)
W71-12784

FLOOD PLAIN INFORMATION, McCAIN CREEK AND GILMER BAYOU, SHREVEPORT, LOUISIANA.
Corps of Engineers, New Orleans, La.

Army Corps of Engineers Flood Plain Report, January 1971. 66 p, 15 fig, 45 plate, 19 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Louisiana, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge.
Identifiers: *Floods (Shreveport, La), Standard project flood, Intermediate regional flood.

Flooding along McCain Crrek and Gilmer Bayou in the vicinity of Shreveport, Louisiana is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. Duration of floods is prolonged on the lower reaches of McCain Creek. During the Standard Project Flood overbank flooding would exist for 21 days at Cooper Road and the maximum rate of rise would be 2.9 feet per day. On McCain Creek at Pine Hills Road the duration of overbank flooding for the Standard Project Flood would be 22 hours and the maximum rate of rise would be 1.0 foot per hour. (Woodard-USGS)
W71-12785

FLOOD PLAIN INFORMATION, PALO DURO AND TIERRA BLANCA CRREKS, CANYON, TEXAS.
Corps of Engineers, Tulsa, Okla.

Army Corps of Engineers Flood Plain Report, February 1971. 35 p, 5 fig, 20 plate, 11 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Texas, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge.
Identifiers: *Floods (Canyon, Tex), Standard project flood, Intermediate regional flood.

Flooding along Palo Duro and Tierra Blanca Creeks in the vicinity of Canyon, Texas is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The greatest known flood in the study are occurred in August 1968. During this period, 7.87 inches of rainfall were recorded at the West Texas State University rain gage. There were reports of up to 13 inches of rain in some adjacent areas. The peak flow at Canyon was estimated to be 15,500 cubic feet per second. (Woodard-USGS)
W71-12786

FLOOD PLAIN INFORMATION, MONOCACY RIVER, FREDERICK COUNTY, MARYLAND.
Corps of Engineers, Baltimore, Md.

Army Corps of Engineers Flood Plain Report, February 1971. 29 p, 3 fig, 19 plate, 8 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Maryland, Regional flood, Flood forecasting, Flood control, Design flood, Peak discharge, Historic flood.
Identifiers: *Monocacy River (Frederick Co., Md), Standard project flood, Intermediate regional flood.

Flooding along Monocacy River in Frederick County, Maryland is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights, and other technical data. The greatest known flood occurred in June 1889 when the stage of the Monocacy River at Jug Bridge reached 30.0 feet and the discharge 56,000 cfs. The Standard Project Flood for Monocacy River at the Jug Bridge gage would have a peak discharge of 152,900 cubic feet per second, resulting from a total rainfall of 11.4 inches in 96 hours, with a maximum of 6.8 inches falling in a six-hour period. (Woodard-USGS)
W71-12787

FLOOD PLAIN INFORMATION, LEON CREEK, SAN ANTONIO, TEXAS.
Corps of Engineers, Fort Worth, Tex.

Army Corps of Engineers Flood Plain Report, April 1971. 37 p, 3 fig, 33 plate, 11 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Texas, Regional flood, Flood forecasting, Flood control, Historic flood, Peak discharge.
Identifiers: *Floods (San Antonio, Tex), Standard project flood, Intermediate regional flood.

Flooding along Leon Creek in the vicinity of San Antonio, Texas is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data.

Duration of floods is short on Leon Creek and its tributaries. Stages can rise from streambed to extreme flood peaks in a few hours following intense rainfall. During the Intermediate Regional Flood, Leon Creek would remain out of banks about 22 hours in the vicinity of U.S. 90 (business route). During the Standard Project Flood on upper Leon Creek, the stream in the same vicinity would rise about 26 feet above banks in 36 hours, with a maximum rate of rise of 2 feet per hour, and would remain out of banks for about 46 hours. (Woodard-USGS)
W71-12788

PUBLIC IRRIGATION SYSTEMS IN PUERTO RICO,
Puerto Rico Water Resources Authority, San Juan.
R. R. Garcia.
Proc Amer Soc Civ Eng, J Irrig Drain Div, Vol 97, No IR1, p 109-122, Mar 1971. 14 p, 1 fig, 2 tab.

Descriptors: Aquatic plants, *Aquatic weed control, Climate, Rainfall, Canals, Dalapon, Financing, Groundwater, Dams, Water rights, *Irrigation systems, Employee relations, Reservoirs, Taxes, Topography, *Operation and maintenance, Population growth, Sedimentation, *Water supply, Spillways.
Identifiers: Aqualin, Operating personnel, Puerto Rico, Toa Vaca Dam, Puerto Rico, Bureau of Reclamation.

General information is presented concerning the circumstances and conditions under which public irrigation in Puerto Rico has evolved and the role it plays in the agricultural and economic development of the island. Emphasis is placed on several operation and maintenance problems encountered in the administration of 3 public irrigation systems. Farm sizes, land tenure, and farm irrigation methods and practices are described. The experience acquired in the control of aquatic and emergent weed growth in irrigation canals by chemical means is analyzed, together with the methods used in the application of Aqualin, Dalapon, and Sylvex herbicides. Reference is made to a program for maintenance of dams established with technical assistance from the Bureau of Reclamation. Reservoir sedimentation and the consequent loss of storage and water control capacity in the South Coast irrigation system are analyzed, and alternate solutions are studied. (USBR)
W71-12889

THE INFLUENCE OF THE UNSATURATED FLOW DOMAIN ON SEEPAGE THROUGH EARTH DAMS,
For primary bibliographic entry see Field 08D.
W71-12890

JACKSON PARISH WATERSHED DISTRICT.
For primary bibliographic entry see Field 06E.
W71-12957

THE ECOSYSTEM CONCEPT IN NATURAL RESOURCE MANAGEMENT,
George M. Van Dyne.
383 p. Illus. Academic Press: New York, N. Y., London, England. 1969. Pr. $16.50.
Identifiers: Book, Ecosystem, Management, Natural, Resource, Symposium.

This volume is based on a symposium held at the annual meeting of the American Society of Range Management in Albuquerque, New Mexico, on Feb. 12-15, 1968, containing papers covering the natural resource fields: range, forest, watershed, fishery and wildlife resource science and management. The papers explain and evaluate the ecosystem concept and its application to research, management and training in the natural resource sciences; historical developments of the ecosystem concept are integrated with current applications while new trends in the training of scientists and managers are indicated. Mentioned is the development of ecological terminology in the historical survey presented in section I. Examples of research include procedures for study of grassland, studies of nutrient cycles, the arctic tundra, forestry (population dynamics, production and the history of study of forest ecosystems), vegetation composition and secondary production in ungulates and models for systems approach in water optimization. The final section discusses the ecological revolution, the computational revolution and implementing the concept into undergraduate and graduate programs and in continuing education programs.--Copyright 1971, Biological Abstracts, Inc.
W71-12960

HERBICIDES IN IRRIGATION WATER FOLLOWING CANAL-BANK TREATMENT FOR WEED CONTROL,
Agricultural Research Service, Denver, Colo. Research Div.
P. A. Frank, R. J. Demint, and R. D. Comes.
Weed Science. 18 (6): 687-692. Illus. 1970.
Identifiers: Acetic-Acid, Bank, Canal, Chloro, Control, D, Dalapon, Herbicides, Irrigation, Pollutant, Tri, Water, Weed.

Maximum concentrations of dalapon in the water varied from 23 to 365 ppb (parts/billion) from application rates of 6.7 to 20 lb/acre. The highest levels of trichloroacetic acid ranged from 31 to 128 ppb following applications of 3.8 to 5.9 lb/acre. Applications of 1.9 to 3 lb/acre of 2,4-D produced maximum concentrations of 25 to 61 ppb. Reduction of herbicide levels appeared to be due to dilution as the water flowed downstream. Rates of reduction in herbicide levels showed that negligible concentrations would remain after the water traveled a distance of 20 to 25 mi. The low concentrations of herbicides in the irrigation water is not hazardous.--Copyright 1971, Biological Abstracts, Inc.
W71-12980

LENTICEL AND WATER ROOT DEVELOPMENT OF SWAMP TUPELO UNDER VARIOUS FLOODING CONDITIONS,
Southeastern Forest Experiment Station, Athens, Ga.
Donald D. Hook, Claud L. Brown, and Pul P. Kormanik.
Bot Gaz. 131 (3): 217-224. Illus. 1970.
Identifiers: Development, Flooding, Lenticel, Nyssa-Sylvatica-Var-Biflora-D, Phellogen, Root, Soil, Swamp, Tupelo-D, Under, Water.

Seedlings of swamp tupelo (Nyssa sylvatica var. biflora (Walt.) Sarg.) were grown in nonflooded soil or soil that was intermittently flooded, continuously flooded, or surface-saturated with moving or stagnant water. Lenticels on nonflooded seedlings were round, only slightly hypertrophied, and had few closing layers. Degree of hypertrophy and number of closing layers per lenticel increased with surface saturation and intermittent flooding, but closing layers were absent under continuous flooding. Flooded lenticels remained nearly round despite variations in hypertrophy. In all treatments, intercellular spaces were abundant in the complementary tissue and phellogen because of the spherical shape of these cells. Although the continuity of intercellular spaces was interrupted because the closing layers anastomosed, breaks within the closing layers prevented these spaces from being completely blocked. Water roots developed primarily under continuous flooding in moving water, some apparently originating beneath the phellogen of a lenticel and other within the phellogen or its derivatives.--Copyright 1971, Biological Abstracts, Inc.
W71-12985

4B. Groundwater Management

DEVELOPMENT OF SYSTEMS FOR GROUND WATER RECHARGE INTO THE OGALLALA FORMATION,
Texas Tech Univ., Lubbock. Dept. of Agricultural Engineering.
M. J. Dvoracek, and S. H. Peterson.
Available from the National Technical Information Service as PB-202 630, $3.00 in paper copy, $0.95 in microfiche. Texas Tech University Water Resources Center Project Completion Report, WRC-71-4, June 1971. 34 p, 5 fig, 3 tab, 17 ref. OWRR B-041-TEX (6).

Descriptors: *Groundwater recharge, *Artificial recharge, *Groundwater movement, Surveys, Water resources development, Water supply, Water yield, Investigations, Test procedures, Hydrogeology, Aquifers.
Identifiers: *Ogallala formations (Tex).

Water is the most important limiting factor to agricultural production and economic growth in the Southern High Plains of Texas. The use of groundwater from the Ogallala Formation has helped to remove these water limitations but the remaining water in the Ogallala Aquifer is rapidly being depleted. Research was concentrated on the removal of sedimentation as a restriction to artificial recharge. Gravity flow recharge wells appear to be an effective means of recharge. As particle size of the aquifer decreases, increasing attention was given to the possible effects of the introduction of foreign materials into the formation. Other groundwater recharge methods discussed are filtration systems, trenches, shafts, and shallow holes. (Woodard-USGS)
W71-12245

HYDROGEOLOGICAL AND GROUNDWATER ASPECTS OF ARTIFICIAL RECHARGE,
Water Resources Board, Reading (England).
J. Ineson.
Paper No 1 of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970: The Water Research Association, Marlow, England. 14 p, 1 ref.

Descriptors: *Artificial recharge, *Conference, Water management (Applied), Economics, Reviews, Hydrogeology, Aquifer characteristics, Water chemistry, Social aspects, Legal aspects, Saline water intrusion, Water reuse, Groundwater recharge.

This introduction to the Artificial Recharge Conference, Reading, England, 1970, presents some of the broad principles of artificial recharge which are governed by hydrogeological and groundwater conditions. Artificial recharge is not necessarily the solution to every water resource problem in a particular area. Recharge represents only one of a number of resource options. A variety of factors have to be taken into consideration; for example, hydrological, hydrogeological, chemical, biological, operational, economic and social. Only after considering the implication of each of these can a rational solution be found, which may not necessarily be the cheapest. The extent to which hydrogeological and groundwater considerations influence the choice of an artificial recharge scheme depends upon such factors as the relationship between the physical and mechanical properties of the previous media and desirable infiltration rates, the efficacy of the constituent material to effect or to assist chemical and biological improvement, the ability of the water bearing deposits to store water recharge temporarily and subsequently to permit groundwater movement laterally at acceptable rates and over adequate retention times and the efficiency of abstraction works to recover the recharged water. (Knapp-USGS)
W71-12404

ECONOMIC FEASIBILITY OF ARTIFICIAL RECHARGE,
Water Research Association, Marlow (England).
P. A. Mawer, and J. P. J. O'Kane.
Paper No 2 of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970: The Water Research Association, Marlow, England. 35 p, 11 fig, 3 tab, 6 ref, append.

Descriptors: *Artificial recharge, *Conjunctive use, *Economics, *Economic feasibility, *Mathematical models, Model studies, Recharge wells, Injection wells, Water spreading, Alluvial channels, Hydrogeology, Regime, Water treatment, Water reuse, Withdrawal, Water storage.

The economics of streamflow regulation by surface storage and aquifer recharge were compared. The alternative use of artificial recharge as a water treatment process was not considered in detail. The comparison is based on the identification of the required recharge input rating and the required surface storage volume necessary to achieve any specified degree of regulation, and several unit cost parameters. A streamflow regulation model can be used to determine the economic relationships for surface and aquifer storage. A simple cost model of aquifer and surface storage compares the likely unit costs of the component works of the two alternatives. Application of the general methods to four specific rivers, together with an assumption of representative unit costs, shows artificial recharge to be particularly favorable over storage at high degrees of regulation and on rivers which exhibit a high persistence in their flow characteristics. Systems containing a mix of both surface and aquifer storage were investigated. The provision of surface storage upstream of artificial recharge could lead to total system costs which are significantly lower than those associated with surface-only or aquifer-only storage systems. (Knapp-USGS)
W71-12405

THE DESIGN OF ARTIFICIAL RECHARGE SCHEMES,
Vattenbyggnadsbyran Ltd., Stockholm (Sweden).
For primary bibliographic entry see Field 05D.
W71-12406

THE PRINCIPLES AND PRACTICE OF PRETREATMENT FOR ARTIFICIAL RECHARGE,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 05F.
W71-12407

CLOGGING PROCESSES AND OPTIMIZATION OF BASIN RECHARGE,
Water Planning for Israel Ltd., Tel Aviv.
J. E. Berend.
Paper No 5 of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970: The Water Research Association, Marlow, England.

Descriptors: *Artificial recharge, *Water spreading, *Infiltration, *Optimization, Permeability, Hydrogeology, Transmissivity, Water quality, Water treatment, Groundwater movement, Soil water movement.

The entire path of artificially recharged water, from the source to a general point in the aquifer, must be considered when attempting to reach an optimal solution for a water spreading scheme. In a general case, which is often the practical situation, several principal factors must simultaneously be taken into account. These include the permeability of the unsaturated layers, the transmitting and storage capacity of aquiferous layers and clogging processes. In the majority of practical cases the factor which limits the infiltration is located at the ground surface. This limiting factor may be a semi-previous soil layer, underlayed by equally or more previous ones, or a clogged layer at the surface. Quantitative evaluation of each layer and a method of synthesis are essential for obtaining an optimal solution, since improvement of just one factor may put into the foreground limitations posed by another one. (Knapp-USGS)
W71-12408

METHODS OF SUSTAINING GOOD INFILTRATION RESULTS,
North Holland. Provincial Waterworks (Netherlands).
J. Haasnoot, and K. W. H. Leeflang.
Paper No 6 of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970: The Water Research Association, Marlow, England. 28 p, 9 fig, 10 tab, 4 ref.

Descriptors: *Artificial recharge, *Pit exchange, *Water treatment, *Water reuse, Reclaimed water, Dunes, Sands, Coagulation, Filtration, Oxidation, Chlorination, Water quality, Water chemistry, Water management (Applied).

Infiltration in the Dutch dunes includes great improvement of quality. Starting from a highly polluted source followed by a restricted pretreatment, it relies entirely upon passage through a shallow aquifer. The oxygen demand of the water to be infiltrated is high. There is no possibility of a new oxygen supply after it has nearly been exhausted by its consumption in the immediate environment of the infiltration basins. The elimination of organic matter is by chemical or biological oxidation processes. In the chemical treatment powerful reagents such as chlorine or ozone are used, and the biological processes make use of oxygen or nitrates. The main part of this concept of purification lies in the pretreatment, the infiltration acting as a final resource and safeguard. Pretreatment should go far; in some aspects it should even surpass common drinking water standards. The complete removal of suspended matter and iron allows the use of high infiltration rates without causing too much clogging. It is advantageous to exclude the other cause of clogging, algal growth, by covering the infiltration basins. (Knapp-USGS)
W71-12409

FUNDAMENTAL VARIATIONS IN THE WATER QUALITY WITH PERCOLATION IN INFILTRATION BASINS,
Institute for Water Research Ltd., Dortmund (West Germany).
W. H. Frank.
Paper No 7 of Artificial Groundwater Recharges Conference, University of Reading, England, September 21-24, 1970: The Water Research Association, Marlow, England. 22 p, 25 fig.

Descriptors: *Artificial recharge, *Induced infiltration, *Pit recharge, *Water treatment, *Filtation, Alluvia channels, Surface-groundwater relationships, Permeability, Algae, Dissolved oxygen.
Identifiers: *Ruhr Valley.

The Dortmunder Stadtwerke AG supplies about 100 million cu m of municial and industrial water per year from the groundwater collected in the alluvium of the Ruhr valley. The aquifer is 4 to 5 m deep and is covered by a layer of meadow loam 0.5 to 2 m thick. The permeability of the gravel is in general very good, about .001 to 0.01 m/sec. More than 90% of the groundwater consists of varying proportions of bank infiltration and artificially recharged groundwater. In dry years with little water flow, more than 75% of the required water must be artificially recharged. The infiltration takes place in basins measuring 25 x 200 m. A layer of sand 50 to 70 cm thick is laid down as a filter bed. This sand has an effective particle diameter (d 10%) of 0.12 mm, and at (d 60%) of 0.3 mm a coefficient of non-uniformity of U — 2.5. Its permeability in most areas is less than that of the subsoil. Both the bank infiltration and the artificially recharged groundwater are re-collected at a depth of 7 m after a passage of at least 50 m through the soil and passed directly into the mains without further treatment after a light precautionary chlorination. Suspended organic and inorganic matter is largely retained on the filter surface. Together with the algae which grow there, they cause an obstruction in the filter. The dissolved organic material in the water is mineralized with the help of the bacteria which inhabit the filter, oxygen being consumed and carbon dioxide liberated. In the water above an exposed sand filter, algae cause a distinct drop in the phosphate ion concentration. In the upper most layers of sand more phosphate ions are liberated by microbiol decomposition than the bacteria need for their metabolism. (Knapp-USGS)
W71-12410

WATER QUALITY ASPECTS OF INTERMITTENT SYSTEMS USING SECONDARY SEWAGE EFFLUENT,
Water Conservation Lab., Phoenix, Ariz.
For primary bibliographic entry see Field 05D.
W71-12411

PRACTICAL EXPERIENCES OF WELL RECHARGE,
Water Planning for Israel Ltd., Tel Aviv.
Y. Harpaz.
Paper No 12 of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970: The Water Research Association, Marlow, England. 31 p, 12 fig, 2 tab, 14 ref.

Descriptors: *Artificial recharge, *Recharge wells, Injection wells, Hydrogeology, Water treatment, Water conservation, Water reuse, Arid lands, Water sources, Water supply, Aquifers, Aquifer characteristics, Limestones, Sandstones, Basalts, Water quality, Water chemistry.
Identifiers: *Israel.

Artificial recharge has been extensively practiced in Israel for more than ten years. At present, some 90% of the water potential is used annually, of which groundwater is the bigger share. Artificial replenishment of groundwater reservoirs is an important means not only for increasing the total yield, but for optimizing the operation of the national water system and managing water quality problems. Of all the artificial recharge methods, well-recharge is now the most widely practiced method in Israel. The artificial recharge projects are located mainly in the cental part of the country. Most of them are designed to replenish the highly exploited sandstone aquifers of the Coastal Plain, a few others are situated above the limestone aquifers in the western foothills, and some are in the Galilee area. (Knapp-USGS)
W71-12412

ARTIFICIAL GROUNDWATER RECHARGE PRACTICE IN ISRAEL: ECONOMIC ANALYSIS,
Mekoroth Water Co., Tel Aviv (Israel).
E. Zabludowski.
Supporting Paper A of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970: The Water Research Association, Marlow, England. 13 p, 1 map, 3 tab.

Descriptors: *Artificial recharge, *Cost-benefit analysis, *Water costs, Water conservation, Arid lands, Water supply, Water utilization, Water demand.
Identifiers: *Israel.

Groundwater recharge operations in Israel are effected through the annual diversion of 130 million cubic meters of surplus seasonal flows of the Jordan River Basin. There are three purposes to the recharge operations: prevention of aquifer destruction, long term storage compensation for water shortages in time of drought, and seasonal storage and exploitation to increase water supply to consumers during the 3 peak demand months. Long

term storage, whether viewed as an insurance for safeguarding steady water supply even in years of drought, or when considered from the point of view of the marginal value of water to agriculture, is economically justified. Seasonal storage and exploitation enables the increase in water deliveries during the peak demand months. The value of the marginal water deliveries during the peak months exceeds the costs. (Knapp-USGS)
W71-12413

SANITARY SIGNIFICANCE OF COLIFORM BACTERIA IN RECHARGE WELLS,
Mekoroth Water Co., Tel Aviv (Israel).
For primary bibliographic entry see Field 05B.
W71-12414

RECHARGE OF CARBONACEOUS SALINE AQUIFER OF SOUTH FLORIDA WITH TREATED SANITARY WASTEWATER,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
For primary bibliographic entry see Field 05G.
W71-12415

ARTIFICIAL RECHARGE INVESTIGATIONS BY THE WATER RESOURCES BOARD,
Water Resources Board, Reading (England).
H. J. Richards, and R. L. H. Satchell.
Supporting Paper D of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970: The Water Research Association, Marlow, England. 7 p.

Descriptors: *Artificial recharge, *Water resources development, Water costs, Cost-benefit analysis, Hydrogeology, Recharge wells, Pit recharge, Water spreading.
Identifiers: *England, *Wales.

The artificial recharge of aquifers in England and Wales has a significant role in the development of water resources. The major aquifers involved are the Chalk and the Triassic sandstones. The Water Resources Board is vigorously pursuing a program of research aimed at establishing the technical feasibility of recharging parts of these aquifers, with assessment of the economics of incorporating such schemes into regional water-resource development plans. Pilot schemes on a significant scale are necessary and these involve substantial effort and expenditure; staff and funds have been made available. (Knapp-USGS)
W71-12416

WATER WELLS IN THE HARPER, SUPERIOR, AND CUDDEBACK VALLEY AREAS, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W71-12417

RELATIONS BETWEEN THE ABSTRACTION OF GROUND WATER AND THE VARIATIONS OF GROUND-WATER LEVEL,
Ceskoslovenska Akademie Ved, Brno. Geograficky Ustav.
Hubert Kriz.
Journal of Hydrology, Vol 13, No 3, p 254-262, July 1971. 5 fig, 1 tab, 3 ref.

Descriptors: *Water yield, *Withdrawal, *Drawdown, *Water level fluctuations, *Hydrogeology, Discharge (Water), Groundwater movement, Water wells, Springs, Statistical methods.
Identifiers: *Czechoslovakia, *Aquifer tests, *Aquifer evaluation.

During hydrogeological prospecting on the Cretaceous Plateau of Moravia, in central Czechoslovakia, the relations between the abstraction of groundwater and the variations of its level were studied in detail. By statistical study of weekly yields it was possible to determine the long-term safe rate of abstraction of water from the aquifer. The mode of test pumping together with the prolonged time of its duration, 5 years, was suitable for the determination of the relations between the abstraction of groundwater and the vertical changes of the groundwater level. (Knapp-USGS)
W71-12462

RADIUS OF INVESTIGATION IN DC RESISTIVITY WELL LOGGING,
National Geophysical Research Inst., Hyderabad (India).
A. Roy, and R. L. Dhar.
Geophysics, Vol 36, No 4, p 754-760, August 1971. 4 fig, 5 ref.

Descriptors: *Borehole geophysics, *Electrical well logging, *Calibrations, *Resistivity, Electrical studies, Instrumentation, Electrodes, Conductivity, Electrical conductance, Surveys, Investigations.
Identifiers: *Radius of investigation (Well logging).

The contribution to the measured signal of any desired portion of the ground (as distinct from that of the rest of the ground) in a direct current (dc) well logging system can be computed by using the equivalence between dc and electrostatic fields. Considering a thin cylindrical shell having its axis coincident with that of the sonde, the contribution of the shall usually begins with a small value for small values of shell radii and goes through a few extrema before falling to zero at large radii. The radius of investigation of a sonde is defined to be that radius at which the contribution of the cylindrical shell is a maximum and has the same sign as the total measured signal. With this definition, the radii of investigation of the various sondes come out approximately as follows: Wenner, 0.19L; Schlumberger, 0.20L; Normal, 0.60L; Lateral, 0.40L; and Laterology, 0.30L-0.15L where L is the distance between the extreme active electrodes. The radius of investigation for the unfocused normal sonde seems to be much larger than that for the focused laterolog device.
W71-12602

NUCLEAR WELL LOGGING IN HYDROLOGY.
For primary bibliographic entry see Field 02F.
W71-12616

EARTHQUAKE-ACCELERATED DECLINE OF WATER LEVEL IN AN OBSERVATION WELL IN ST. THOMAS, VIRGIN ISLANDS,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 02F.
W71-12680

THE USE OF WELL LOGGING IN RECHARGE STUDIES OF THE OGALLALA FORMATION IN WEST TEXAS,
Geological Survey, Denver, Colo.
W. S. Keys, and R. F. Brown.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B270-B277, 1971. 7 fig, 5 ref.

Descriptors: *Borehole gcs, *Cores, *Sampling, Porisity, Specific yield, Permeability, Particle size, Subsurface investigations, Radioactivity techniques, Artificial recharge, Aquifers, Aquifer characteristics.
Identifiers: Ogallala Formation (Tex), Lubbock (Tex).

As a part of a study of artificial-recharge processes by the U.S. Geological Survey, a series of test holes were drilled in the Ogallala Formation in the southern High Plains of west Texas. Drive cores taken in each lithologic unit were analyzed for moisture content, specific retention, total porosity, specific yield, permeability, and grain-size distribution. Some of these parameters are correlated with neutron, natural gamma, and gamma-gamma geophysical logs. These correlations permit a better delineation of the hydrologic characteristics of the Ogallala Formation than had previously been possible. An apparent relationship between the ratios of naturally occurring radioisotopes and calcium carbonate may prove useful for detecting caliche in boreholes. (Knapp-USGS)
W71-12684

A DIMENSIONLESS PARAMETER STUDY OF GROUNDWATER RECHARGE IN OKLAHOMA,
Oklahoma Univ. Research Inst., Norman.
For primary bibliographic entry see Field 02F.
W71-12697

SALT WATER AND WASTE DISPOSAL WELLS: STATE REGULATIONS AND GEOLOGICAL PROBLEMS,
Louisiana Geological Survey, Baton Rouge.
For primary bibliographic entry see Field 05G.
W71-12765

WATER WELLS IN THE SAN LUIS REY RIVER VALLEY AREA, SAN DIEGO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W71-12790

A DISPERSION MODEL FOR A QUANTITATIVE STUDY OF A GROUNDWATER POLLUTION BY SALT,
National School of the Bridges and Roads, Paris (France).
For primary bibliographic entry see Field 05B.
W71-12798

A BUBBLER-MANOMETER WATER LEVEL SENSING AND RECORDING SYSTEM,
Saskatchewan Research Council, Saskatoon.
For primary bibliographic entry see Field 07B.
W71-12805

MEASUREMENT OF VERTICAL GROUNDWATER VELOCITY FROM TEMPERATURE PROFILES IN WELLS,
Geological Survey, Denver, Colo. Water Resources Div.
For primary bibliographic entry see Field 02F.
W71-12809

4C. Effects on Water of Man's Non-Water Activities

HYDROLOGIC RESPONSE OF WATERSHEDS TO LAND USE MANAGEMENT,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
L. M. Glymph, H. N. Holtan, and C. B. England.
ASCE Proceedings, Journal of the Irrigation and Drainage Division, Vol 97, No 1 R-2, Paper 8174, p 305-318, June 1971. 10 fig, 8 ref.

Descriptors: *Water yield, *Land use, *Mathematical models, *Rainfall-runoff relationships, Streamflow, Water management (Applied), Soil physical properties, Infiltration, Stratigraphy, Vegetation effects, Rainfall disposition, Ohio, Nebraska, Texas.
Identifiers: Land use-Water yield relations, Coshocton (Ohio), Hastings (Nebr), Riesel (Tex).

Some potentials for influencing streamflow by land use management on three ARS research watersheds at Coshocton, Ohio, Hastings, Nebr., and Riesel, Tex. were explored through applications of the USDAHL-70 Model of Watershed Hydrology. Three hypothetical levels of land use management were considered: (1) Exploitive land

use, farming of all lands which could be reasonably put into row crops; (2) conservation land use, farming row crops in rotation and conformance with recommended soil protection and water management practices; and (3) converting the watersheds entirely to grass. The interactions of soil characteristics, stratigraphy, vegetation, tillage practices and rainfall patterns cause different responses at each location. The rationale for the model and the different effects of land use are analyzed. At each of these locations, exploitive use of the land resulted in increased water yield. In each case, this increase in water yield was caused by a reduction in the vegetative parameter of the infiltration equation. Conservative use of the land resulted in an increase in water yields at Coshocton, a decrease at Hastings, and an increase at Riesel. These changes were also associated with changes in infiltration capacity. Converting the watersheds to grass increased water yields at Coshocton and decreased them at Hastings and Riesel. Replacement of deep-rooted woods by grass at Coshocton reduced the reservoir for evapotranspiration and thereby increased the base flow component of water yields. At Hastings and Riesel, conversion to grass increased infiltration capacity and runoff was reduced. (Knapp-USGS)
W71-12251

REFORESTATION INFLUENCES ON SMALL WATERSHED STREAMFLOW,
Agricultural Research Service, Coshocton, Ohio. North Appalachian Experimental Watershed.
J. L. McGuinness, and L. L. Harrold.
Water Resources Research, Vol 7, No 4, p 845-852, August 1971. 5 fig, 19 ref.

Descriptors: *Duration curves, *Rainfall-runoff relationships, *Reforestation, *Land management, *Watershed management, Ohio, Clear-cutting, Peak discharge, Low flow, Water yield, Erosion control, Small watersheds.

Analysis of flow duration curves showed that reforestation of a 44-acre watershed near Coshocton, Ohio, reduced flow in the low flow tail of the curve but did not significantly reduce flows above 0.25 inch per day. Other analyses showed that reductions also occurred in the maximum annual flow volumes for all periods of flow durations of 1 day or longer. The onset of dormant season flow as significantly delayed. (Knapp-USGS)
W71-12450

STATE-OF-THE-ART OF LITTORAL DRIFT MEASUREMENTS,
Tetra Tech., Inc, Pasadena, Calif.
For primary bibliographic entry see Field 02J.
W71-12468

VEGETATIONAL PATTERN NEAR ALPINE TIMBERLINE AS AFFECTED BY FIRE-SNOW-DRIFT INTERACTIONS,
Duke Univ., Durham, N.C. Dept. of Botany.
W. D. Billings.
Vegetatio. 19 (1-6): 192-207. Illus, 1969 (recd 1970).

Descriptors: *Vegetation, *Alpine, *Forest management, *Forest fires, *Snowpacks, Tundra, Vegetation effects, Winds.
Identifiers: *Snowdrifts, Bow, Interactions, Mountains, Subalpine, Timberline, Wyoming.

In the central Rocky Mountains (Medicine Bow Mt., Wyoming), flat areas or gentle slopes just below timberline exhibit a vegetational pattern consisting of ribbon forests and snow glades lying across the path of the prevailing winds. The pattern is the result of removal of snow by wind from the open areas and its deposit in a great drift about 60-100 m in from the windward edge of the forest. This drift remains too long during the summer for tree growth. Consequently, the vegetation in the drift area is a wet or moist subalpine meadow occupying the snow glade and, in effect, breaking the forest into ribbon-like patches. The source area for the snow may be natural climax tundra, tundra which has replaced burned subalpine forest, or subalpine meadow of edaphic origin. The ribbon forest and snow glade pattern can be expected just below climatic timberline wherever plateaus or gentle slopes are exposed to heavy snowfall, strong winter winds, and cool summers. Destruction of such ribbon forest by fire or cutting will result in new snowdrift patterns, and the long-lasting replacement of the forest by alpine or subalpine meadow vegetation.--Copyright 1971, Biological Abstracts, Inc.
W71-12514

GRAPHIC ANALYSIS OF ROADWAY RUNOFF,
California Div. of Highways, Fresno. District 6.
J. B. Wolfson.
Civil Engineering, Vol 41, No 6, p 64-65, June 1971. 2 fig.

Descriptors: *Rainfall-funoff relationships, *Runoff forecasting, *Cities, *Urbanization, Time lag, Time of concentration, Storm runoff, Roads, Rational formula, Surface runoff.
Identifiers: *Street runoff.

The drainage design of highways requires computation of the storm water runoff for various widths, lengths and slopes of roadway at variable times of concentration. Curves are derived to give a graphic analysis for determining the rate of storm water runoff that will occur for a particular frequency storm. To accomplish this the rainfall, surface area of the roadway, and time of concentration are related to various slopes of roadway. The chart gives a picture of the flow that can be expected as the length of the pavement or the time of concentration varies by the addition of a lag time or roof to gutter time. (Knapp-USGS)
W71-12587

LAND USE EFFECTS ON THE HYDROLOGIC CHARACTERISTICS OF SOME HAWAII SOILS,
Forest Service, Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 02G.
W71-12599

EFFECTS OF URBANIZATION ON SEDIMENT TRANSPORT IN BEL PRE CREEK BASIN, MARYLAND,
Geological Survey, College Park, Md.
T. H. Yorke, and W. J. Davis.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B218-B223, 1971. 5 fig, 2 tab, 8 ref.

Descriptors: *Urbanization, *Sedimentation, *Maryland, *Sediment yield, *Land use, Construction, Cities, Storm runoff, Erosion, Road construction, Water pollution sources, Topography, Soil erosion, Streamflow, Water yield.
Identifiers: *Montgomery County (Md), *Urban sedimentation, *Urban hydrology.

The effect of urban expansion on the sediment yield of a 1.7-square-mile drainage basin is described. Streamflow and sediment data were collected at a gaging station on Bel Pre Creek in Montgomery County, Md., between 1963 and 1967. Prior to March 1965, the drainage area was used for pasture and woodland; however, between March 1965 and August 1967, part of the basin was developed for garden apartments and townhouses. A graphical regression analysis indicated that the storm runoff increased 30 percent and the sediment yield was 14 times greater as a result of urban construction 15 percent of the drainage basin. The sediment yield from the construction sites was 90 times greater than the yield expected from the area with the original land-use conditions. (Knapp-USGS)
W71-12674

WATER LEVEL SURFACES IN THE AQUIFERS OF WESTERN LONG ISLAND, NEW YORK, IN 1959 AND 1970,
Geological Survey, Mineola, N.Y.
G. E. Kimmel.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B224-B228, 1971. 6 fig, 1 tab, 5 ref.

Descriptors: *Hydrogeology, *Water balance, *Water levels, *Water sources development, *New York, Urbanization, Groundwater, Groundwater movement, Aquifers, Aquifer characteristics, Sands, Transmissivity, Hydraulic conductivity.
Identifiers: *Long Island (NY).

During the period 1959-70, groundwater levels in northwestern Nassau and east-central Queens Counties declined 20 to 25 feet. The magnitude and extent of the declines in the water table and in the Magothy potentiometric surface were roughly similar. The data suggest a high degree of hydraulic interconnection between the water table and the base of the Magothy aquifer, which includes from 200 to 1,100 feet of saturated unconsolidated deposits. The decline in water levels probably resulted from decreased recharge and increased pumping in an area of relatively low transmissivity. Groundwater levels also declined because of the construction of sanitary sewers and the concurrent decrease in recharge resulting from the discontinued use of many thousands of cesspools. (Knapp-U
W71-12675

BRIGHT, BREATHING EDGES OF CITY LIFE PLANNING FOR AMENITY BENEFITS OF URBAN WATER RESOURCES,
Moore (Arthur Colton) Associates, Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-12687

A MICROBIOLOGICAL AND CHEMICAL INVESTIGATION OF EFFECTS OF MULTIPLE USE ON WATER QUALITY OF HIGH MOUNTAIN WATERSHEDS,
Montana State Univ., Bozeman. Joint Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W71-12690

MICROBIOLOGICAL STUDIES IN AN OPEN AND A CLOSED WATERSHED,
Montana State Univ., Bozeman, Joint Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W71-12691

VARIOUS ESTIMATES OF THE EFFECT OF AGRICULTURE ON RUNOFF,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
N. I. Koronkevich.
Soviet Hydrology: Selected Papers, No 1, p 21-29, 1970. 5 fig, 5 tab, 15 ref. Translated from Izvestiya Akad Nauk SSSR, Ser Geog, No 1, p 49-58, 1970.

Descriptors: *Rainfall-runoff relationships, *Land use, *Water balance, Water utilization, Consumptive use, Evapotranspiration, Soil-water-plant relationships.
Identifiers: USSR.

Experimental data are used to estimate the effect of autumn plowing on slope runoff for individual natural zones of the USSR. Two versions of the water-balance method of computing the transformations of slope and river runoff were compared. One method uses average data for the entire observation record of runoff stations, and the other takes into account the wetness of individual years and periods. The present reduction in the long-period average Don River runoff at the Georgiu-Dezh gag-

ing station, as compared with the period prior to 1950, is estimated at 9% by the first method and 8% by the second. The decrease is 5% in wet years and 10-11% in medium wet and dry years. (Knapp-USGS).
W71-12815

SPAWNING BED SEDIMENTATION STUDIES IN NORTHERN CALIFORNIA STREAMS,
California State Dept. of Fish and Game. Sacramento.
James W. Burns.
Calif Fish Game. 56 (4): 253-270. Illus. 1970.

Descriptors:
Identifiers: Bed, California, Northern, Oncorhynchus-Kisutch, Salmo-Clarki-Clarki, Salmo-Gairdneri-Gairdneri, Sedimentation, Spawning, Streams, USA.

Changes in the size composition of spawning bed materials in 6 coastal streams were monitored for 3 yr to determine the effects of logging on the habitat of silver salmon Oncorhynchus kisutch and trout Salmo gairdnerii gairdnerii and S. clarkii clarkii. Four test streams were sampled before, during and after logging. Two streams in unlogged watersheds and the undisturbed upstream section of 1 test stream served as controls. A variety of stream types in 2nd-growth and old-growth forests was selected for observation. Spawning bed composition in the 4 test streams changed after logging, roughly in proportion to the amount of streambank disturbance. The heaviest sedimentation occurred when bulldozers operated in narrow stream channels having pebble bottoms. In a larger stream with a cobble and boulder bottom, bulldozer operations in the channel did not increase sedimentation greatly. Sustained logging and road construction kept sediment levels high in 1 stream for several years. Sedimentation was greatest during periods of road construction near streams and removal of debris from streams, confirming the need for special measures to minimize erosion during such operations. Control streams changed little in spawning bed composition during the 3 yr.--Copyright 1971, Biological Abstracts, Inc.
W71-12900

MAN-MADE CLIMATIC CHANGES,
Maryland Univ., College Park. Inst. of Fluid Dynamics and Applied Mathematics.
For primary bibliographic entry see Field 02B.
W71-13024

4D. Watershed Protection

NONSCOURING VELOCITIES OF ASH DEPOSITS ON ASH DUMPS OF THERMAL ELECTRIC POWERPLANTS (O nerazmyvayushchikh skorostyakh zol'nykh otlozhenly na zolootvalakh teplovykh elecktricheskikb stantsly),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 02J.
W71-12852

A WET SAND DOSIMETER FOR ADDING SEDIMENTS TO AN ERODIBLE MODEL (Dozimetr syrogo peska dlya podachi nanosov na razmyvayemuyu model'),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 02J.
W71-12854

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

TEMPERATURE, DISSOLVED OXYGEN AND SALINITY DATA FOR THE PENOBSCOT RIVER ESTUARY, 1966-1970.
Maine Univ., Orono, Cooperative Fishery Unit.
For primary bibliographic entry see Field 02L.
W71-12246

MINOR ELEMENTS IN WATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02K.
W71-12269

DETERMINATION OF INERT GASES IN WATER,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
G. Post.
The Progressive Fish-Culturist, Vol 32, No 3, p 170-173, July 1970. 1 fig, 2 tab, 2 ref.

Descriptors: *Gases, *Nitrogen, *Analytical techniques, Water pollution effects, Water properties, Water quality, Assay, Laboratory tests, Pollutant identification, Testing, Test procedures, Water pollution, Aquatic environment, Oxygen, Carbon dioxide, Water chemistry.
Identifiers: *Inert gases, Gas bubble disease, Water testing.

Excess inert gases in water become a potential hazard when released from water containing fish populations. A significant pathology is associated with these gases, as they are not absorbed by fish tissues so readily as other gases, e.g. oxygen, and they tend to accumulate in body spaces. It is necessary, therefore, to be able to evaluate this hazard. In the method described, gases are driven from a known volume of water by heating and are trapped in a syringe. The volume of total gases is noted, and CO2 and O2 are then selectively absorbed. The remaining volume of gas consists of inert gases, primarily nitrogen. (LeGore-Washington)
W71-12298

OPEN SEAWATER SYSTEM WITH CONTROLLED TEMPERATURE AND SALINITY,
Bureau of Commercial Fisheries, Beaufort, N.C., Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05C.
W71-12308

CHAPTER 1. CHEMICAL, PHYSICAL, AND BIOLOGICAL CHARACTERISTICS OF WATER RESOURCES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02A.
W71-12348

CHAPTER 7. CHEMICAL, PHYSICAL, AND BIOLOGICAL CHARACTERISTICS OF WASTES AND WASTE EFFLUENTS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 02A.
W71-12354

POTOMAC RIVER WATER QUALITY NETWORK, WATER YEAR 1970.
Interstate Commission on the Potomac River Basin, Washington, D.C.

Interstate Commission on the Potomac River Basin Compilation Report, 1971. 108 p, 2 fig, 2 map.

Descriptors: *Water quality, *Hydrologic data, *Data collections, *River basins, Chemical analysis, Water chemistry, Maryland, Virginia, District of Columbia, Networks, Annual, Water year.
Identifiers: *Potomac River Basin, Basic data.

The Potomac River Water Quality Network--1970 is the thirteenth in this Network series published annually by the Interstate Commission. The 1970 report (Oct. 1, 1969-Sept. 30, 1970), summarizes water data exclusively for the Potomac River Basin. The data were obtained from samples taken by 15 agencies, industries, and municipalities. In addition to the Network stations, West Virginia Department of Natural Resources stations and EPA-WQO-USGS cooperative stations have been included. The data were obtained from the STORET system. STORET is a multi-user computer system designed to manage water quality data in the most efficient and accurate way possible. A statistical summary includes the high, low, mean, and standard deviation of the various parameters. In addition, selected parameters from specific stations were automatically plotted. Comparisons may be made between previously recorded water quality data plots and this year's Network data plots. The raw data as obtained from the cooperators are tabulated. (Knapp-USGS)
W71-12363

PESTICIDE ADSORPTION MEASUREMENT BY FLOW EQUILIBRATION AND SUBSEQUENT DISPLACEMENT,
du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Lab.
R. E. Green, and J. C. Corey.
Soil Science Society of America Proceedings, Vol 35, No 4, p 561-565, July-August 1971. 5 fig, 2 tab, 12 ref. USAEC Contract AT (07-2)-1.

Descriptors: *Pollutant identification, *Pesticide residues, *Soil chemical properties, Equilibrium, *Adsorption, Leaching, Analytical techniques, Chemical analysis.
Identifiers: *Atrazine, Diuron.

Adsorption of pesticides from solution was measured by continuous-flow equilibration and subsequent displacement from the soil by organic solvents. This new method and the conventional batch-equilibration method gave similar results for adsorption of diuron and atrazine on three surface soils. The flow method gave superior precision to the batch method on the subsoils studied. The new procedure is well adapted to studies of adsorption reversibility and also has the advantage of limited destruction of soil aggregates during equilibration. (Knapp-USGS)
W71-12380

COMPUTATION OF RIVER WATER MINERALIZATION DURING FORECASTING BY MEANS OF A 'NAIRI' ELECTRONIC COMPUTER,
Rostov-onDon State Univ., USSR.
For primary bibliographic entry see Field 07C.
W71-12403

A FLUOROMETRIC TECHNIQUE FOR SAMPLING IN LARGE RIVER ECOSYSTEMS,
Michigan State Univ., Lansing. Dept. of Fisheries and Wildlife; and St. Marys Coll., Winona, Minn. Dept. of Biology.
For primary bibliographic entry see Field 02E.
W71-12421

DESCRIPTION AND FORMATION OF THE CHEMICAL COMPOSITION OF ATMOSPHERIC WATERS AND WATERS OF ARID REGIONS. METHODS OF STUDY (Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i vod sushi. Metody ikh izucheniya).
Gidrokhimicheskii Institut, Novocherkassk (USSR).
For primary bibliographic entry see Field 02K.
W71-12434

A SPECTROGRAPHIC DETERMINATION OF Ni, Co, Ag, V, Sn, Mo, Ti, Al, Bi, Fe, Pb and Mn IN NATURAL WATERS WITH HIGH COPPER CONTENT (Spektrograficheskoye opredeleniye Ni, Co, Ag, V, Sn, Mo, Ti, Al, Bi, Fe, Pb, Mn v prirodnykh vodakh pri povyshennykh kontsentratsiyakh medi),
Gidrokhimicheskii Institut, Novocherkassk (USSR).
For primary bibliographic entry see Field 02K.
W71-12445

A PHOTOMETRIC DETERMINATION OF B, Mo, Mn, Cu and Zn IN WATER OF FERTILIZED FISH PONDS (Fotometricheskoye opredeleniye B, Mo, Mn, Cu i Zn v vode udobryayemykh rybovodnykh prudov),
Vserossiiskii Nauchno-Issledovatelskii Institut Prudovogo Rybnogo Khozyaistva, Moscow (USSR).
For primary bibliographic entry see Field 02K.
W71-12448

ION PAIRING AND WATER QUALITY MEASUREMENTS,
Waterloo Univ. (Ontario). Environmental Fluid Mechanics Lab.
T. M. L. Wigley.
Canadian Journal of Earth Sciences, Vol 8, No 4, p 468-476, April 1971. 8 tab, 38 ref. Canada Nat'l Research Council Grant A5141.

Descriptors: *Water chemistry, *Aqueous solutions, *Solvation, *Electrolytes, Solutes, Water properties, Ions, Chemical reactions, Hydrolysis.
Identifiers: *Ion pairing.

The effect of ion pairing on water analyses is examined. Significant changes in composition details and saturation indices can occur in waters of moderate-to-high sulfate content. Revised estimates of the equilibrium constants for gypsum and dolomite for various temperatures are presented. The amount of pairing of cations with sulfate ions is largely independent of pH. However, the ratio of bicarbonate pairing to carbonate pairing decreases rapidly with increasing pH. For sulfate ions, ion pairing increases with increasing concentration. Even for low concentrations, only about 80% to 85% of sulfate is present as the free ion. 9knapp-USGS)
W71-12465

BUILDING A SHORTER LIFE,
Committee for Environmental Information, St. Louis, Mo.
For primary bibliographic entry see Field 05B.
W71-12470

CLUSTERING OF SULFUR DIOXIDE AND WATER VAPOR ABOUT OXONIUM AND NITRIC OXIDE IONS,
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 01B.
W71-12475

PRIMARY PRODUCTIVITY IN THE TAGUS AND SADO ESTUARINES FROM MAY 1967 TO MAY 1968 (IN PORTUGUESE),
E. DE S. E Silva, M. E. Assis, and M. A. M. Sampayo.
Notas Estud Inst Biol Mar (Lisboa). 37. 1-46. Illus, Map, 1969 (Engl summ).

Descriptors: *Estuaries, *Plankton, *Detritus, Water pollution sources.
Identifiers: Carotenoids, Chlorophyll, Portugal, Sado, Tagus River.

Primary productivity was studied at 3 stations on each estuary of the Tagus and Sado rivers. The spectrophotometric method was employed for quantitative determination of pigments: chlorophylls a, b and c, non astacin carotenoids and astacin carotenoids. In the same water samples a study of the microplankton both on living and preserved material was made. Pigments were much more abundant in samples from the Tagus estuary than in those from the Sado. Some of the high values obtained there were not related to a very rich plankton but were constituent of abundant vegetal detritus originated both by great differences in salinity and by pollution of waters in a very industrialized region. Planktonic composition of waters in the 2 estuaries was very different. In the Tagus estuary the number of individuals was generally much more important than the number of species; some fresh water forms could be often found especially at the innermost stations and vegetal detritus were generally seen in abundance. The waters from the Sado estuary showed much less abundance of pigments than those from the Tagus and their planktonic composition was mainly constituted by marine forms--the index of diversity being higher which means more species and less number of individuals. Generally, the primary productivity in waters of the Tagus estuary seems to come from the river while the richness of the Sado estuary seems to have its origin in marine plankton.--Copyright 1971, Biological Abstracts, Inc.
W71-12509

VIBRIO PARAHAEMOLYTICUS STUDIES: (VIII) ON THE 'SPECIFIC' VIBRIO PARAHAEMOLYTICUS EXISTING FOR A LONG PERIOD OF TIME IN CITY RIVER-WATER, (IN JAPANESE),
Nagasaki Prefectlare Inst. of Public Health (Japan).
For primary bibliographic entry see Field 05C.
W71-12564

THE WATER CHEMISTRY AND PESTICIDE LEVELS OF UTAH LAKE,
Brigham Young Univ., Provo, Utah. Dept. of Chemistry.
J. S. Bradshaw, J. R. Barton, D. A. White, J. L. Bangerter, and W. D. Johnston.
Proceedings of the Utah Academy of Sciences, Arts, and Letters, Vol 46, Part 2, p 81-101, 1969. 6 fig, 8 tab, 13 ref.

Descriptors: *Water quality, *Lakes, *Utah, Pesticide residues, Water chemistry, Dissolved solids, Salinity, Water analysis, Monitoring, Water pollution sources.
Identifiers: *Utah Lake.

The amount of inorganic contaminants in Utah Lake probably increased almost twofold between 1884 and 1900. This value has remained fairly constant since that time. From 1961 to 1968 a complete study of the water chemistry of Utah Lake was carried out on a regular basis. An analysis of the data from the 1968 study, using the IBM 360 computer, reveals that the concentration of many dissolved ions decreased over the summer months while that of other ions increased. The concentrations of almost all ions was greater in Goshen Bay than the rest of Utah Lake. An analysis of chlorinated hydrocarbon pesticides was also carried out. There are trace amounts of DDT type materials as well as gamma-BHC and heptachlor in the waters of Utah Lake. With the exception of a high dissolved solid content of over 1000 mg/liter, the water in the center portion of Utah Lake can be classified as adequate for drinking purposes. (Knapp-USGS)
W71-12585

PREVENTION AND CONTROL OF OIL SPILLS.
For primary bibliographic entry see Field 05G.
W71-12588

IDENTIFICATION OF OIL LEAKS AND SPILLS,
Standard Oil of California, San Francisco.
R. E. Kreider.
In: Proceedings of Joint Conference on Prevention and Control of Oil Spills, June 15-17, 1971, Washington, D.C.; American Petroleum Institute Publication, Washington, D.C., p 119-124, 1971. 6 fig, 4 tab, 15 ref.

Descriptors: *Water pollution sources, *Oil industry, *Oil wastes, *Water pollution control, *Pollutant identification, Indicators, Analytical techniques, Instrumentation, Sampling, Water analysis.
Identifiers: *Oil spills.

Development of a method for comparison of unknown petroleum leaks and spills with known sources is reported. Methods of sampling and preparation of a residue, free of water and solids, equivalent to a 24-hour weathered sample are described. The principal method of analysis is high-resolution temperature programmed gas chromatography. Additional analyses considered are sulfur, nitrogen, nickel, vanadium and infrared. Analyses of samples by 10 cooperating laboratories are reported. (See also W71-12588) (Woodard-USGS)
W71-12590

MERCURY IN THE ENVIRONMENT,
Committee for Environmental Information, St. Louis, Mo.
For primary bibliographic entry see Field 05B.
W71-12603

ADSORPTION OF MICROQUANTITIES OF YTTRIUM-91 FROM SEA WATER ON FTOROPLAST-4, POLYETHYLENE AND PAPER,
V. N. Ivanov, and A. A. Lyubimov.
Oceanology (USSR), Vol 10, No 3, p 419-423, December 1970. 5 p, 2 fig, 2 tab, 13 ref.

Descriptors: *Adsorption, *Sampling, *Trace elements, *Sea water, *Water chemistry, Radioisotopes, Water analysis, Hydrolysis, Aqueous solutions, Path of pollutants.
Identifiers: *Yttrium radioisotopes.

Maximal adsorption of yttrium-91 from sea water on Ftoroplast-4, polyethylene and filter paper (blue band) was obtained after 3 days. Adsorption takes place in two stages. The first stage, which ends in about 1.5 hour, is followed by a slower increase in the adsorption coefficients. The complex nature of the relationship between yttrium adsorption and time is due to a change in state of the yttrium-91 in sea water during the course of hydrolysis. (Knapp-USGS)
W71-12629

CALCULATING POTASSIUM CONTENT AND POTASSIUM RADIOACTIVITY OF SEA WATER FROM MEASURED SALINITY,
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
For primary bibliographic entry see Field 02K.
W71-12645

POSSIBILITY OF DETERMINING THE CONCENTRATION OF SUSPENDED MATTER BY AN OPTICAL METHOD,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 07B.
W71-12646

DETERMINATION OF MICROQUANTITIES OF NICKEL AND COBALT IN SMALL WEIGHED PORTIONS OF MARINE SUSPENDED MATTER (FROM THE BALTIC SEA AND ATLANTIC OCEAN),
K. B. Yatsimirskiy, Ye. M. Yemel'yanov, V. K. Pavlova, and Ya. S. Savichenko.
Oceanology (USSR), Vol 10, No 6, p 901-905, 1970. 2 tab, 17 ref.

Descriptors: *Suspended load, *Trace elements, *Chemical analysis, *Analytical techniques, Sampling, Sediments.
Identifiers: *Nickel, *Cobalt.

Microquantities of nickel and cobalt were analyzed in small weighed portions of marine suspended matter (1 to 3 mg) collected on biological filters with pores 0.7 microns in diameter. The catalytic reaction tiron-diphenylcarbazone - hydrogen peroxide was selected and analyzed for quantitative determination of nickel. The quantitative determination of cobalt was based on the oxidation of alizarin by hydrogen peroxide at pH 12.4. The sensitivity of the reaction was 0.001 micrograms/liter for nickel and 0.00005 micrograms/liter for cobalt. The relative error in determining cobalt and nickel was 20% and 27-53%, respectively. Suspended matter from the Atlantic Ocean basin (0- to 1-m layer) contained from 0.002 to 0.38 micrograms/liter of nickel and from 0.00007 to 0.019 micrograms/liter of cobalt. (Knapp-USGS)
W71-12662

A PRE-IMPOUNDMENT ECOLOGICAL STUDY OF THE BENTHIC FAUNA AND WATER QUALITY IN THE NORTH ANNA RIVER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W71-12693

URBAN RUNOFF CHARACTERISTICS,
Cincinnati Univ., Ohio. Div. of Water Resources.
For primary bibliographic entry see Field 05G.
W71-12703

AN INVESTIGATION OF THE POTENTIAL PROBLEM OF INCREASING BORON CONCENTRATIONS IN RIVERS AND WATER COURSES,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05B.
W71-12724

RAPID DETECTION OF E. COLI IN WATER BY USE OF C14,
Institute of General and Municipal Hygiene, Moscow (USSR).
L. E. Korsh, V. F. Zheverzheeva, and E. P. Nikiforova.
Hygiene and Sanitation, Vol 35, No 4, p 99-103, April 1970. 2 fig, 2 tab, 3 ref.

Descriptors: *Coliforms, *Radioactive tracers, Water analysis, Water quality control, Analytical techniques, Sampling, Bacteria, Microorganisms, Radioisotopes, Carbon dioxide, Membranes, Filtration, Toxicity, *E. coli, *Pollutant identification.
Identifiers: Concentration.

Nearly all microorganisms in a water sample will use C14 and liberate C14- labeled C14O2, which can then be detected with a counter and the number of pulses/min recorded. In order to make the test specific, enrichment techniques are used. The media used in this case was rosolic agar, on account of its specificity for coliform organisms. Samples from various locations were taken and incubated at 42 deg. for 4 hours. Measurement of the pulses included measurement for a control group, measurement of the background radiation, and measurement of the experimental culture. The No. of pulses originating from the C14 labeled CO2 was 2 to 3 times the number from interfering sources. Tests were also performed to determine whether or not other aquatic organisms influenced the readings, but no detectable influence was found. The method is applicable to nearly all water supplies from effluents to drinking waters. However, when contamination is slight, the bacteria must be concentrated. If membrane filters are used to concentrate the bacteria, they must be carefully processed. (Lowry-Texas)
W71-12730

ORGANO-CHLORINE INSECTICIDES IN WATER--PART II,
Water Pollution Research Lab., Stevenage (England).
G. F. Lowden, C. L. Saunders, and R. W. Edwards.
Water Treatment and Examination, Vol 18, p 275-294, 1969. 20 p, 3 fig, 6 tab, 22 ref, Water Pollution Research Laboratory Reprint No. 585.

Descriptors: Waste water treatment, *Pesticide residues, DDT, Gas chromatography, Rivers, Surface runoff, Adsorption, Toxicity, *Insecticides, Sewage treatment, Dieldrin, Pollutant identification, Path of pollutants, Water pollution sources.
Identifiers: TDE, Alpha BHC, Gamma BHC.

A broad survey of sewage treatment plants and rivers in specific areas of the British Isles was conducted to determine the concentrations of insecticide residues to be expected. Insecticides studied included alpha and gamma BHC, Dieldrin, TDE, and DDT. Insecticides were extracted from the water samples with n-hexane and concentrations were determined by gas chromatography. Results are divided into three sections. Sewage treatment plants-Spot samples provide a range of concentrations to be expected and indicates the effect of treatment on the concentration of the insecticide. River-Lee system-Results show the build up of insecticide concentrations downstream. Contaminant is primarily gamma BHC. Similar data from the Yorkshire and Lancashire Rivers was collected at 43 sampling stations during 2 periods. Results compared with similar data from the U.S.A. show that concentrations are higher in these two areas than in the U. S. (Goessling-Texas)
W71-12733

WATER QUALITY STANDARDS.
New Mexico Water Quality Control Commission, Sante Fe.
For primary bibliographic entry see Field 05G.
W71-12782

ULTRAVIOLET COMBUSTION OF DISSOLVED ORGANIC NITROGEN COMPOUNDS IN LAKE WATERS,
Michigan State Univ., Hickory Corners, W.K. Kellogg Biological Station.
B. A. Manny, M. C. Miller, and R. G. Wetzel.
Limnology and Oceanography, Vol 16, No 1, p 71-85, 1971. 17 fig, 3 tab, 26 ref.

Descriptors: *Primary productivity, *Analytical techniques, *Trophic levels, *Nitrogen compounds, Eutrophication, Fresh water, Organic compounds, Nitrogen.
Identifiers: Ultraviolet combustion, Dissolved organic nitrogen.

The described procedure for the determination of dissolved organic nitrogen offers a much greater sensitivity in comparison with the micro-Kjeldahl method. The recommended ultraviolet combustion of freshwater samples is of 1.5 3.0 hr duration with a continuous oxygenation and at pH 4.0 buffered with boric acid. The rate of nitrogen release is a function of the nature of the dissolved nitrogen compound, the concentration of the total dissolved carbon, and the concentration of mineral salts. Analyses of lakes of different trophic levels should reveal the role of the DONC in the primary production of lake ecosystems. (Wilde-Wisconsin)
W71-12860

A COMPARISON OF A SIMPLE CORER AND AN EKMAN GRAB FOR SAMPLING SHALLOW-WATER BENTHOS,
Waterloo Univ. (Ontario). Dept. of Biology.
C. G. Paterson, and C. H. Fernando.
Journal Fisheries Research Board of Canada, Vol 28, No 3, p 365-368, 1971. 1 tab, 8 ref.

Descriptors: *Sampling, *Benthos, *Shallow water, Density, Freshwater, Invertebrates, Lentic environments, Volume, Sediments, Oligochaetes, Diptera.
Identifiers: *Ekman grab, Macroinvertebrates, Corer.

Collection of several samples from each station is necessary for a sample mean in studying freshwater benthic invertebrates in shallow lenthic habitats. Actual number of samples depends on abundance of fauna and selected level of accuracy which often results in an effort requirement beyond feasibility. Sorting benthic invertebrates from substrate material, particularly in shallow waters where high proportion of coarse material prevents easy concentration by sieving or flotation, is time consuming. Thus a sampler that lifts small volumes of substrate material is desirable. In shallow waters the additional effort involved in collecting more small samples, as opposed to fewer large ones, would be unimportant compared with times saved in sorting a smaller total volume. Properties of a simple core sampler were compared with those of a conventional Ekman grab in an attempt to reduce the effort required to adequately sample shallow water benthos. Estimates of invertebrate density were found to be about 50% higher when samples were taken with a 25.6 sq cm corer than with an Ekman grab. Corer use also decreased volume of sediment collected and reduced tediousness of examining large samples. (Jones-Wisconsin)
W71-12866

METHODS FOR DETERMINING THE PRIMARY PRODUCTIVITY OF EPIPELIC AND EPIPSAMMIC ALGAL ASSOCIATIONS,
Bristol Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 05C.
W71-12870

A SYSTEM FOR MAINTAINING CONSTANT DISSOLVED OXYGEN CONCENTRATIONS IN FLOWING-WATER EXPERIMENTS,
Humboldt State Coll. Arcata, Calif.
For primary bibliographic entry see Field 05C.
W71-12882

DATA ON THE ROLE OF CHROMIUM, LEAD, VANADIUM, AND NATURAL RADIOACTIVITY OF FOOD PRODUCTS IN THE ETIOLOGY OF ENDEMIC GOITER,
Kiev Meditsinskii Institut (USSR).
P. I. Barannik, I. A. Mikhalyuk, and I. N. Motuzkov.
Gig Sanit. 35 (2): 103-105, 1970.
Identifiers: Chromium, Endemic, Etiology, Food, Goiter, Human, Ivanovskii, Lead, Natural, Products, Radioactivity, USSR, Vanadium.

Spectrographic and beta-ray studies of food products from the Ivanovskii Region (USSR), an area of moderate occurrence of endemic goiter, are reported. A statistically significant increase in Cr, Pb and Va levels was detected. Natural radioactivity was on the order of 10 to the minus 9th power Ci/kg, but no correlation with the occurrence of goiter was established.--Copyright 1971, Biological Abstracts, Inc.
W71-12937

LEACHING LOSSES OF NITROGEN AND POTASSIUM IN POLDERS RECLAIMED FROM LAKE IJSSEL,
IJsselmeerpolders Development Authority, Kampen (Netherlands). Biology Lab.
For primary bibliographic entry see Field 02H.
W71-12945

THE DISTRIBUTION OF SULPHUR IN THE MUD OF LAKE VICTORIA,
Rothamsted Experimental Station, Harpenden (England).
For primary bibliographic entry see Field 02H.
W71-12946

POTASSIUM, SODIUM, MAGNESIUM AND CALCIUM CONTENTS OF CHINOOK SALMON TISSUES DURING VARIOUS STAGES OF THE LIFE CYCLE,
Harvard Medical School, Boston, Mass.
For primary bibliographic entry see Field 05C.

W71-12976

HERBICIDES IN IRRIGATION WATER FOLLOWING CANAL-BANK TREATMENT FOR WEED CONTROL,
Agricultural Research Service, Denver, Colo. Research Div.
For primary bibliographic entry see Field 04A.
W71-12980

IDENTIFICATION AND DETERMINATION OF METHYLMERCURY COMPOUNDS IN FISH USING COMBINATION GAS CHROMATOGRAPH-MASS SPECTROMETER,
Karolinska Institutet, Stockholm (Sweden). Lab. of Mass Spectrometry.
Britta Johansson, Ragnar Ryhage, and Gunnel Westoo.
Acta Chem Scand. 24 (7): 2349-2354. Illus. 1970.
Identifiers: Chromatograph, Combination, Counpounds, Determination, Fish, Gas, Identification, Mass, Mercury, Methyl, Spectrometer.

The identification and determination of methylmercury compounds in fish by the use of a combined gas chromatograph-mass spectrometer and a standard gas chromatograph with an electron capture detector are described. Samples containing 0.15-3.2 mg Hg/kg fish flesh were studied. The results of the 2 methods are compared.--Copyright 1971, Biological Abstracts, Inc.
W71-13003

INTERNATIONAL COOPERATIVE STUDY OF ORGANOCHLORINE PESTICIDE RESIDUES IN TERRESTRIAL AND AQUATIC WILDLIFE, 1967/1968,
Freshwater Fisheries Lab., Pitlochry (Scotland).
For primary bibliographic entry see Field 05B.
W71-13029

A CHEMICAL TAGGING SYSTEM FOR USE IN THE PREVENTION OF OIL SPILLS,
American Cyanamid Co., Central Research Div.
For primary bibliographic entry see Field 05G.
W71-13055

OIL SPILL PREVENTION AND DETECTION USING AN INSTRUMENTED SUBMERSIBLE,
Vast, Inc., and Prototypes, Inc.
For primary bibliographic entry see Field 05G.
W71-13058

5B. Sources of Pollution

PROPERTIES OF TILE DRAINAGE WATER,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
T. L. Willrich.
Paper No 70-752 presented at 1970 Winter Meeting of the American Society of Agricultural Engineers, December 8-11, 1970, Chicago, Illinois. 10 p, 9 tab. OWRR Project A-013-IA (4).

Descriptors: *Tile drainage, *Water properties, *Fertilization, *Cultivated lands, *Iowa, Water quality, Fertilizers, Nutrients, Nitrogen compounds, Phosphorus compounds, Potash, Algae, Aquatic plants, Chemical analysis, Water pollution sources.

A study of plant nutrient content and pollutional characteristics of Iowa tile drainage water was conducted from July 1965 through June 1969. Plant nutrients and soil amendments are leached from the soil by percolating water and are conveyed to receiving streams through tile drains when drainage flow occurs. Some of these nutrients have the potential to degrade water quality to the extent that beneficial uses of the water may be impaired. The concentrations of nitrogen (median values ranged from 12.4 to 27.4 mg/liter) and phosphorus (median values of 0.2 to 0.3 mg/liter) found in the tile drainage water samples were sufficiently high to be conductive to the growth of algae and other aquatic plants. (Woodard-USGS)
W71-12252

BIOLOGICAL EFFECTS OF OIL POLLUTION IN THE SANTA BARBARA CHANNEL,
University of Southern California, Los Angeles.
For primary bibliographic entry see Field 05C.
W71-12262

OCEAN DUMPING. A NATIONAL POLICY.
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-12295

MIXING STUDIES ASSOCIATED WITH THERMAL POLLUTION,
Maryland Univ., College Park. Dept. of Mechanical Engineering.
James E. A. John, Bal Mahajan, and Safa Kanbour.
Available from the National Technical Information Service as PB-202 695, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Center, College Park, Completion Report, December 1970. 77 p, 31 fig, 1 tab, 7 ref. OWRR Project A-007-MD (5).

Descriptors: *Thermal pollution, *Mixing, *Industrial water, *Cooling water, Power plants, Temperature, Distribution patterns, Flow characteristics, Ecology, Water temperature, Turbulence.

Studies were made of mixing in relation to thermal pollution by the University of Maryland. The flow pattern and temperature distribution from the discharge of a submerged two-dimensional turbulent hot water jet into a large still reservoir of cooler water was studied. Barriers were then placed around the point of exhaust to further confine the warmer water. Methods for the mixing of a thermally stratified flow in a channel were investigated for the reuse of the thermally stratified water near the jet exhaust. This can be applied in any closed circuit condenser intake in order to avoid local hot water regions detrimental to condenser operation. The effect on thermal mixing of a stratified channel flow resulting from the introduction of rigid barriers normal to the flow is considered. (Ensign-PAI)
W71-12328

CHAPTER 2. PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF ESTUARIES,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 02A.
W71-12349

CHAPTER 3. CHEMICAL, PHYSICAL, AND BIOLOGICAL CHARACTERISTICS OF IRRIGATION AND SOIL WATER,
Department of Agriculture, Riverside, Calif., Salinity Lab.
For primary bibliographic entry see Field 02A.
W71-12350

CHAPTER 4. SELF-PURIFICATION IN NATURAL WATERS,
Ecoscience Lab., Norwich, Conn.
For primary bibliographic entry see Field 02A.
W71-12351

CHAPTER 6. THE EFFECTS OF POLLUTION UPON AQUATIC LIFE,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 02A.
W71-12353

CHAPTER 7. CHEMICAL, PHYSICAL, AND BIOLOGICAL CHARACTERISTICS OF WASTES AND WASTE EFFLUENTS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 02A.
W71-12354

GROUND DISPOSAL OF PESTICIDES: THE PROBLEM AND CRITERIA FOR GUIDELINES.
Working Group on Pesticides, Rockville, Md.
For primary bibliographic entry see Field 05E.
W71-12356

CHARACTERISTICS OF TRANSVERSE MIXING IN OPEN-CHANNEL FLOWS,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.
Josephat K. Okoye.
California Institute of Technology, W. M. Keck Laboratory of Hydraulics and Water Resources Report No KH-R-23, November 1970. 269 p, 75 fig, 18 tab, 67 ref. FWQA Grant No. 16070 DGY.

Descriptors: *Open channel flow, *Mixing, *Tracers, *Streamflow, Tracking techniques, Hydraulic gradient, Model studies, Mathematical studies, Equations, Flow characteristics, Diffusion, Turbulent flow, Analytical techniques, Channel morphology.
Identifiers: *Open channel flow (Transverse mixing).

The transverse spreading of a plume generated by a point source in a uniform open-channel flow is investigated. A neutrally-buoyant tracer was injected continuously at ambient velocity through a small round source at a point within the flow. Tracer concentration was measured at several points downstream of the source using conductivity probes. Time-averaged concentration was evaluated, its distribution within the plume determined, and characteristic coefficients of transverse mixing calculated. The transverse mixing coefficient varied with the flow level and was highest near the water surface where the flow velocity was greatest. The temporal fluctuation of tracer concentration was studied in three sections. In the first, the intermittency factor technique was used to delineate three regions of the plume cross section. In the second section, the entire plume, at a fixed station, was treated as a fluctuating cloud. In the third section, the intensity and probability density of the concentration fluctuations at fixed points were calculated. (Woodard-USGS)
W71-12357

SANITARY SIGNIFICANCE OF COLIFORM BACTERIA IN RECHARGE WELLS,
Mekoroth Water Co., Tel Aviv (Israel).
J. Eren, and Y. Goldshmid.
Supporting Paper B of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970: The Water Research Association, Marlow, England. 16 p, 3 fig, 5 tab, 9 ref.

Descriptors: *Artificial recharge, *Coliforms, *Water quality, Aquatic bacteria, Groundwater, Water treatment, Water supply, Municipal water.
Identifiers: *Israel.

When water from Lake Kinnereth, Israel, is recharged into a sandy aquifer through dual purpose wells, there are often high coliform counts in the water pumped from these wells. The number of coliforms depends usually on the length of the pause period between end of the recharge and pumping. When the water is pumped immediately at the end of the recharge, the number of coliforms is low. A pause period of a few days or weeks is followed by high counts. After reaching a peak, the coliform count decreases with time. These coliform bacteria are not of fecal origin and there is evidence that they multiply in the well. Tests for enteropathogenic bacteria (Salmonella and Shigel-

la) in recharge wells were negative. Water from recharge wells can be used for public supply after chlorination when it meets the standard set for turbidity and odor, even if the coliform counts are high. (Knapp-USGS)
W71-12414

REGIME OF BIOGENOUS AND ORGANIC SUBSTANCES IN VARIOUS RESERVOIRS OF THE KRASNODAR KRAY (O rezhime biogennykh i organicheskikh veshchestv v nekotorykh vodokhranilishcharkh Krasnodarskogo kraya),
Gidrokhimicheskii Institut, Novocherkassk (USSR).
O. Ye. Lanchikova, and V. T. Kaplin.
In: Kharakteristika i formirovaniye khimicheskogo sostava atmosfernykh vod i vod sushi. Metody ikh izucheniya: Gidrokhimicheskiye Materialy, Vol 54, p 43-52, 1970. 4 fig, 4 tab, 11 ref.

Descriptors: *Water chemistry, *Water analysis, *Water quality, *Organic matter, *Vegetation, Biochemistry, Vegetation effects, Reservoirs, Water pollution, Plants, Seasonal, Ions, Phosphates, Phenols, Amino acids, Decomposing organic matter, Degradation (Decomposition), Hydrologic data.
Identifiers: *USSR, Krasnodar Kray, Krasnodar, Natural waters, Silicon, Monocarboxylic acids, Biogenous substances, Mineralization.

The content of biogenous and organic substances in the water of 4 reservoirs of the Krasnodar Kray was examined for evaluating the importance of vegetation as a principal source of supply of various organic and biogenous substances to natural waters. The reservoirs under consideration are located a sufficient distance from an urban area (about 30 km from Krasnodar) to be free of man-made pollution. The following components in the water samples were determined: ammonium ions, nitrites, nitrates, soluble phosphates and silicon; the organic substances examined included volatile phenol compounds, reducing sugars, free amino acids and monocarboxylic acids. The content of biogenous and organic substances in the waters of all 4 reservoirs underwent seasonal fluctuations. The plant species on watersheds must be taken into account in explaining seasonal changes in the content of biogenous and organic substances in reservoir waters. (See also W71-12434) (Josefson-USGS)
W71-12440

STUDY OF THE FORMS OF LONG-LIVED RADIONUCLIDES IN WATER OF THE DON RIVER (Ob izuchenii form nakhozhdeniya dolgozhivushchikh radionuklidov v vode r. Dona),
Gidrokhimicheskii Institut, Novocherkassk (USSR).
For primary bibliographic entry see Field 02K.
W71-12446

IDENTIFICATION OF MATHEMATICAL MODELS FOR DO AND BOD CONCENTRATIONS IN POLLUTED STREAMS FROM NOISE CORRUPTED MEASUREMENTS,
Purdue Univ., Lafayette, Ind. Dept. of Electrical Engineering.
A. J. Koivo, and G. R. Phillips.
Water Resources Research, Vol 7, No 4, p 853-862, August 1971. 4 fig, 12 ref.

Descriptors: *Mathematical models, *Dissolved oxygen, *Biochemical oxygen demand, *Path of pollutants, Numerical analysis, Reaeration, Data collections, Systems analysis, Data processing, Simulation analysis, Stochastic processes.

A procedure is presented for the determination of the numerical values of parameters in the mathematical model that describes the DO and BOD concentrations in a polluted stream. The numerical values of the reaeration coefficient and the BOD removal coefficient are determined in a systematic manner so that a best fit to the noise-corrupted DO data is obtained asymptotically. The goodness of the estimates is evaluated by the squared difference between measured DO concentrations and concentrations calculated from the mathematical model. A stochastic approximation algorithm of the Robbins-Monro type is applied for computing the parameter values in a sequential manner. The algorithm converges in the mean square sense to the parameter value that furnishes a local minimum for the average of the error criterion. The procedure is illustrated by several numerical examples. Because of the sequential nature of the algorithm, savings in computer time as well as in the required memory capacity are obtained. (Knapp-USGS)
W71-12452

BUILDING A SHORTER LIFE,
Committee for Environmental Information, St. Louis, Mo.
J. McCaull.
Environment, Vol 13, No 7, p 2-15, p 38-41, September 1971. 7 fig, 1 tab, 48 ref.

Descriptors: *Pollutants, *Pollutant identification, *Water pollution sources, *Air pollution, Water pollution effects, Heavy metals, Chemical wastes, Human diseases, Human pathology.
Identifiers: *Cadmium.

A metal released into the environment in large quantities may now be a more insidious threat to human health than mercury. The metal is cadmium, an element that is chemically related to mercury (in the atomic table of elements). More than twice as much cadmium as mercury is used each year in the United States for various technological processes, and accumulating scientific evidence points to cadmium pollution as contributing to fatal arterial hypertensive (high blood pressure) disease. Cadmium was detected in 42 percent of some 720 samples from rivers and reservoirs in the United States in 1970. About 4 percent of the samples had levels of cadmium that exceeded the mandatory U.S. Public Health Service limit for drinking water; about a third of these were in samples from public water supply sources. Cadmium pollution will continue to increase without new, decisive standards limiting environmental release of the metal by human activities. (Woodard-USGS)
W71-12470

CHEMICAL WASTES IN THE SEA: NEW FORMS OF MARINE POLLUTION,
Rijksinstituut voor de Voksgizondheid, Utrecht (Netherlands). Lab. of Toxicology.
P. A. Greve.
Science, Vol 173, No 4001, p 1021-1022, September 10, 1971. 1 fig, 1 tab, 2 ref.

Descriptors: *Chemical wastes, *Water pollution sources, *Oceans, Waste disposal, Organic compounds, Marine fisheries, Chlorinated hydrocarbon pesticides, Pesticide toxicity, Waste identification, Atlantic Ocean.
Identifiers: *Marine pollution, *North Sea, Ocean dumping.

Pollution of the open seas has long been recognized as a serious problem. A new aspect of the problem is the increasing practice of dropping drums of chemical wastes into the sea, and also in shallow fishing waters like the North Sea. In recent years, 80 samples from drums, caught mostly by Dutch fishermen, were analyzed and the wastes were found to include lower chlorinated aliphatic compounds, vinyl esters, chlorinated aromatic amines and nitrocompounds, and the insecticide endosulfan. An experiment is described for toxicity using 2-week-old guppies and the results are summarized. One mixture, even when diluted to 1 part in 100,000,000, was found to be lethal to fish. Plans are being made to clear the drums from at least the intensely fished areas and to burn their contents. (Lang-USGS)
W71-12476

PHYSIOLOGIC-ECOLOGICAL CHARACTERISTICS OF SOME DOMINANT POPULATIONS OF BACTERIA AND ACTINOMYCETES ISOLATED FROM BRACKISH WATERS OF THE DONJA NERETVA RIVER (IN SERBO-CROATIAN),
Sarajevo Univ. (Yugoslavia). Inst. of Biology.
Bosiljka Ristanovic.
Acta Biol Jugoslav Ser B Mikrobiol. 6 (2): 253-259, 1969 (Russ and Engl summ).

Descriptors: *Actinomycetes, *Microorganisms, *Ecosystems, *Saline water, *Rivers.
Identifiers: Donja-Neretva River.

The relations of some dominant bacteria and Actinomycete species to the different C and N sources as well as some ecological factors are investigated. The results show some activities of these microorganisms in the metabolism of the ecosystem.--Copyright 1971, Biological Abstracts, Inc.
W71-12507

CONTAMINATION OF SURFACE WATER: VIROLOGICAL ASPECTS, (IN ITALIAN),
Milan Univ. (Italy). Inst. of Hygiene.
A. Albano, and S. De Donato.
Ig Mod. 61 (11/12): 846-870. 1969. (Engl. summ.).
Identifiers: Contamination, Enterovirus, Reovirus, Surface, Virological, Water.

The presence and survival of some pathogenic viruses (enteroviruses, reoviruses, etc.) in sewage and surface water and their behavior during treatment procedures is reviewed. Possible explanations for the non-occurrence of epidemics or of sporadic cases due to the transmission of these viruses by the water route; the need for Cl treatment at doses well above those commonly used; and the need to find more adequate indicators of viral contamination than those presently used are discussed. Techniques for evaluating viral pollution of surface water must be further defined.--Copyright 1971, Biological Abstracts, Inc.
W71-12565

HYGIENIC SITUATION OF THE COASTAL SEA-WATERS OF NORTH SARDINIA WITH REFERENCE TO THE INDUSTRIAL AND SEWAGE POLLUTION, (IN ITALIAN),
Sassari Univ. (Italy). Istituto di Igiene.
G. Bo, U. Alamanni, A. Maida, E. Bianchi, and S. Pettinato.
Ig Mod. 61 (11/12): 823-845. Illus. Maps. 1969. (Engl. summ.).
Identifiers: Arbatax, Coastal, Hygienic, Industrial, Industry, Mill, North, Paper, Petrochemical, Pollution, Portotorres, Sardinia, Sea, Sewage, Situation, Waters.

Sea-water pollution caused by domestic sewage from coastal cities and by industrial waste (particularly from the petrochemical industry at Portorres), was studied for 2 yr. A high rate of pollution came from Arbatax's paper mill wastes; lesser amounts of pollutants were detected from sewage outlets and petrochemical wastes.--Copyright 1971, Biological Abstracts, Inc.
W71-12567

THE WATER CHEMISTRY AND PESTICIDE LEVELS OF UTAH LAKE,
Brigham Young Univ., Provo, Utah. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W71-12585

PREVENTION AND CONTROL OF OIL SPILLS.
For primary bibliographic entry see Field 05G.
W71-12588

REMOTE SENSING OF OIL SPILLS,
Coast Guard, Washington, D.C. Office of Research and Development.

For primary bibliographic entry see Field 05G.
W71-12589

OIL VERSUS OTHER HAZARDOUS SUBSTANCES,
Environmental Protection Agency, Washington, D.C. Water Quality Office.
For primary bibliographic entry see Field 05G.
W71-12591

PHYSICAL PROCESSES IN THE SPREAD OF OIL ON A WATER SURFACE,
Massachusetts Inst. of Tech., Cambridge. Fluid Mechanics Lab.
J. A. Fay.
In: Proceedings of Joint Conference on Prevention and Control of Oil Spills, June 15-17, 1971, Washington, D.C.; American Petroleum Institute Publication, Washington, D.C., p 463-467, 1971. 6 fig, 2 tab, 7 ref. DOT-CG-01-381-A.

Descriptors: *Water pollution sources, *Oil wastes, *Surface waters, *Dispersion, Mathematical studies, Methology, Forecasting, Oil-water interfaces, Oil industry.
Identifiers: *Oil spills.

Formulae are recommended for calculating the extent of the spread of oil slicks on water as a function of time. They are based on empirical measurements of spreading rates and analytical and theoretical studies of the physical processes which accelerate or retard the spread of a film. Both one-dimensional and two-dimensional (axisymmetric) slicks are treated. Comparisons of the recommended formulae are made with the limited number of field observations, both for the rate of spread and the maximum slick size. (See also W71-12588) (Woodard-USGS)
W71-12592

THE BEHAVIOR OF OIL ON WATER DERIVED FROM AIRBORNE INFRARED AND MICROWAVE RADIOMETRIC MEASUREMENTS,
TRW Systems, Houston, Tex.
J. M. Kennedy, and E. G. Wermund.
In: Proceedings of Joint Conference on Prevention and Control of Oil Spills, June 15-17, 1971, Washington, D.C.; American Petroleum Institute Publication, Washington, D.C., p 469-477, 1971. 7 fig, 2 tab, 4 ref.

Descriptors: *Water pollution sources, *Oil wastes, *Remote sensing, *Oil industry, *Surface waters, Analytical techniques, Instrumentation, Aircraft, Infrared radiation, Microwaves, Tracking techniques.
Identifiers: *Oil spills (Tracking).

Physical properties of oil spills are described, and both infrared imagery and microwave radiometry for tracking and calculating volumes of oil spilled are evaluated. Infrared and microwave methods can effectively operate under day/night and relatively bad weather conditions. These two systems, when operated together, can be used to locate, track, and determine the volume of oil on sea surfaces. In cases of flowing spills, fair estimates of flow rates and the effectiveness of clean up operations can be determined. Also, the temporal image (IR) pattern change can be used to forecast and hindcast surface movements of spills. (See also W71-12588) (Woodard-USGS)
W71-12593

THE MOVEMENT OF OIL SPILLS,
New York Univ., N.Y., School of Engineering and Science.
H. G. Schwartzberg.
In: Proceedings of Joint Conference on Prevention and Control of Oil Spills, June 15-17, 1971, Washington, D.C.; American Petroleum Institute Publication, Washington, D.C., p 489-494, 971. 4 fig, 7 ref.

Descriptors: *Water pollution sources, *Oil wastes, *Oil industry, *Path of pollutants, Surface waters, Movement, Model studies, Winds, Waves (Water), Water temperature, Dispersion.
Identifiers: *Oil spills.

The effects of winds, waves, and currents, and the physical properties of oil and water on the drift rates of oil spills were studied in tests carried out in a combined water basin wind tunnel. On calm water, oil drifted at a fairly constant percentage of the wind speed. Percent drift varied with wind tunnel height. Extrapolation to infinite height indicated that on calm open water wind drift should be 3.7%. Shallow water waves, which produced no significant drift themselves, reduced wind drift. Deep water waves produced by the wind cause significant drift, complicating wind drift prediction, but the magnitude of the wind wave interaction effects is not yet known. Test wind drifts and current drifts were not directly additive. (See also W71-12588) (Woodard-USGS)
W71-12594

MOLLUSKS AND BENTHIC ENVIRONMENTS IN HILLSBOROUGH BAY, FLORIDA,
Bureau of Commercial Fisheries, St. Petersburg Beach, Fla. Biological Lab.
For primary bibliographic entry see Field 02L.
W71-12600

MERCURY IN THE ENVIRONMENT,
Committee for Environmental Information, St. Louis, Mo.
Terri Aaronson.
Environment, Vol 13, No 4, p 16-23, May 1971. 4 fig.

Descriptors: *Water pollution sources, *Water pollution effects, *Heavy metals, *Industrial wastes, *Environmental effects, Reviews, Toxicity, Ecology.
Identifiers: *Mercury, *Water pollution (Mercury).

Sources of mercury in the environment are reviewed. Mercury as an environmental pollutant emerged with the industrial revolution. Levels of mercury in water, as measured by the amount contained in fish, began to increase at the end of the nineteenth century. Water pollution by mercury was further increased in the beginning of this century with the proliferation of chloralkali plants, which use mercury to manufacture industrial chemicals. About 1940, organic mercury compounds were introduced for use as agricultural fungicides, and after that time mercury levels in seed-eating birds rose dramatically. In spite of the increasing emission of mercury to the environment during the past century, the hazards of mercury pollution were unknown until disaster struck in Japan in the 1950s. This first disaster, in the form of mercury poisoning caused by eating contaminated fish, was unfortunately thought to be a strictly local problem. Not until recently has the extent of mercury pollution begun to be appreciated. (Woodard-USGS)
W71-12603

RIVER DISCHARGE OF TRACE ELEMENTS FROM THE TERRITORY OF THE USSR INTO MARINE BASINS,
Nauchno-Issledovatelskii Gidrokhimicheskii Institut, Novocherkassk (USSR).
G. S. Konovalov, and A. A. Ivanova.
Oceanology (USSR), Vol 9, No 4, p 482-488, 1970. 7 p, 2 fig, 2 tab, 11 ref.

Descriptors: *Water chemistry, *Trace elements, *Streamflow, *Suspended load, *Bed load, Sedimentation, Discharge (Water), Weathering, Leaching, Aqueous solutions, Solutes, Water quality, Hydrogeology, Geochemistry, Sampling.
Identifiers: *USSR.

Published data were used to calculate the liquid and solid discharges of trace elements into the sea. The elements studied were V, Mn, Co, Ni, Cu, Zn, Ag, and Mo. These discharges are determined by the chemical properties of the elements, by the migration mobility, and by physiographic conditions in river catchments, including water flow, catchment area relief, and the petrographic features of the rocks in the river basin. Because mountain rivers contain much suspended matter, they carry trace elements mainly in solid form. Lowland and northern rivers carry the elements mainly in dissolved form. The discharge of some elements remains constant during various hydrologic phases in all marine basins. This indicates that the chemical properties of the elements are more important than the physiographic conditions in the basins in determining discharge of these elements. (Knapp-USGS)
W71-12639

DISTRIBUTION OF LONG-LIVED RADIONUCLIDES AND WATER CIRCULATION IN THE TROPICAL ATLANTIC,
N. K. Khanaychenko.
Oceanology (USSR), Vol 10, No 2, p 202-210, November 1970. 9 p, 5 fig, 1 tab, 13 ref.

Descriptors: *Atlantic Ocean, *Ocean circulation, *Radioisotopes, *Tracers, *Fallout, Strontium radioisotopes, Path of pollutants, Ocean currents, Water chemistry, Sampling, Distribution patterns.

Radioactive substances, including long-lived radionuclides have been introduced into the ocean surface from the atmosphere as a result of thermonuclear tests. The possibility of using the uneven distribution of long-lived radionuclides in the ocean to analyze the dynamics of water, is examined. The rates of strontium-90 concentration in the tropical Atlantic in 1963-1964 are established. The irregularites in the distribution of strontium-90 at the ocean surface are explained on the basis of these rates and of existing views on the nature of water circulation. Deep waters only slightly contaminated well up off the northwest coast of Africa and at the periphery of the Brazil Current. The main reason for the high concentrations of strontium-90 in the deep ocean layers is advective transport from the surface into the depths of the ocean. (Knapp-USGS)
W71-12648

ROLE OF MICROORGANISMS GROWING ON OIL IN THE SELF-PURIFICATION AND INDICATION OF OIL POLLUTION IN THE SEA,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
O. G. Mironov.
Oceanology (USSR), Vol 10, No 5, p 646-650, 1970. 7 p, 3 fig, 2 tab, 17 ref.

Descriptors: *Oily water, *Biodegradation, *Bioindicators, Aquatic microorganisms, Oil, Sewage, Nutrients, Self-purification, Sea water, Oxidation, Oxygen demand.
Identifiers: *Oil spills, *Oil pollution, *Hydrocarbons.

Microorganisms isolated from Black Sea and Indian Ocean water are capable of growing on oil and oil products and using them as their sole source of carbon and energy. This indicates that oil products can be oxidized after reaching the sea. However, the great majority of hydrocarbon-oxidizing organisms have demonstrated the ability to grow not only on hydrocarbons but also on other sources of carbon, peptone in particular. Consequently, when hydrocarbon and nonhydrocarbon sources of carbon, especially oil and sewage, enter sea water, self-purification from the organic components of the sewage will be more rapid than destruction of the oil. The close connection between the presence of hydrocarbon-oxidizing microorganisms and oil pollution suggests that this group of bacteria can serve as an indicator of oil pollution in the sea. (Knapp-USGS)
W71-12656

VERTICAL DISTRIBUTION PATTERNS OF DISSOLVED ORGANIC CARBON IN SEA WATER AND INTERSTITIAL SOLUTIONS,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
N. D. Starikova.
Oceanology (USSR), Vol 10, No 6, p 796-807, 1970. 1 fig, 6 tab, 18 ref.

Descriptors: *Organic matter, *Sea water, *Distribution patterns, *Connate water, Water chemistry, Oxidation, Water analysis, Pacific Ocean, Indian Ocean, Sampling, Water analysis, Plankton, Productivity, Organic compounds.
Identifiers: Dissolved organic carbon.

From data on the content of dissolved organic carbon in sea water and interstitial solutions of the Pacific and Indian Oceans, the Black Sea and the Sea of Azov, the vertical distribution pattern in the water column and the sediments (interstitial solutions) was determined. In water the maximum content of dissolved C (organic) is located in the upper producing layers of the seas and oceans, and a steady decrease with depth is observed; this indicates mineralization of the dissolved organic matter. In interstitial solutions of the upper levels of all types of sediments, the average concentration of dissolved C (organic) is 10 times higher than in the bottom water. Farther down, in the column of sediments the distribution of C (organic) follows two patterns. In the interstitial solutions of reduced sediments we observe an increase in C (organic) vertically downward; in the interstitial solutions of oxidized sediments, no increase in concentration is observed. This is due chiefly to the different conditions (oxidizing or reducing) in which metamorphism of the organic matter of sediments takes place. (Knapp-USGS)
W71-12660

DENSITY CURRENTS AND TURBIDITY CURRENTS IN WASTE DISPOSAL IN THE OCEAN--A LITERATURE REVIEW,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
B. S. Jenkins.
New South Wales University, Water Research Laboratory Report No 119, August 1970. 82 p, 12 fig, 106 ref.

Descriptors: *Density currents, *Turbidity currents, *Waste disposal, *Oceans, Reviews, Ocean currents, Density stratification, Heat flow, Lakes, Reservoirs, Unsteady flow, Ocean waves, Water circulation, Suspended load, Sedimentation, Uniform flow, Turbulent flow, Water pollution.

This review is a result of a survey of literature on density currents and turbidity currents and their significance in waste disposal in the marine environment. The survey was carried out as a first step in a program of research sponsored by the Electricity Commission of New South Wales, Australia. The purpose of this program is to gain further insight into the behavior of turbidity currents. The objectives of the survey were to establish the present state of knowledge in this field and to identify those areas in which knowledge was lacking and in which further research is needed. The report is intended for the engineer or student seeking an introduction to the field, the research worker contemplating further fields of research, and the practicing engineer seeking solutions to specific problems. Accordingly, in presenting the review, the objectives have been: (1) to provide an introductory description of the phenomena involved and their significance; (2) to furnish an indication of the present (1970) state of knowledge in the subject; (3) to present as much as possible of the existing knowledge in sufficient detail to permit the solution of some specific problems without further reference to the original source material; and (4) to indicate sources of information relevant to the solution of further problems. (Knapp-USGS)
W71-12665

DISPERSION COMPUTATION AND TEMPERATURE SIMULATION FOR THE CONNECTICUT RIVER ESTUARY BY MATHEMATICAL MODEL,
Geological Survey, Hartford, Conn.
L. A. Weiss.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B211-B217, 1971. 5 fig, 2 tab, 4 ref.

Descriptors: *Dispersion, *Heated water, *Mathematical models, *Thermal pollution, *Estuaries, Nuclear powerplants, Connecticut, Water temperature, Path of pollutants, Streamflow, Discharge (Water), Water levels.
Identifiers: *Haddam Neck (Connecticut), Connecticut River.

The dispersive properties of the Connecticut River at Haddam Neck, Conn., were evaluated and simulated for short time intervals by a one-dimensional mathematical model. The model is based on a thermal survey made on September 9, 1968, at the Connecticut Yankee Atomic Power Co. plant at Haddam Neck. Recorded plant-effluent temperatures, stream temperatures, wind speed, net solar radiation, psychrometer data, air pressure, and river stage are input data for the one-dtion-dispersion model. The longitudinal dispersion coefficients varied from near zero to 3,000 sq ft per sec during a tidal cycle, showing that the dispersion coefficient varies directly with tidal flow. The model was able to predict temperatures at two downstream cross sections within 1 deg Celsius. (Knapp-USGS)
W71-12673

EFFECTS OF URBANIZATION ON SEDIMENT TRANSPORT IN BEL PRE CREEK BASIN, MARYLAND,
Geological Survey, College Park, Md.
For primary bibliographic entry see Field 04C.
W71-12674

A MICROBIOLOGICAL AND CHEMICAL INVESTIGATION OF EFFECTS OF MULTIPLE USE ON WATER QUALITY OF HIGH MOUNTAIN WATERSHEDS,
Montana State Univ., Bozeman. Joint Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W71-12690

MICROBIOLOGICAL STUDIES IN AN OPEN AND A CLOSED WATERSHED,
Montana State Univ., Bozeman, Joint Water Resources Research Center.
For primary bibliographic entry see Field 05C.
W71-12691

ENVIRONMENTAL FACTORS IN COASTAL AND ESTUARINE WATERS, BIBLIOGRAPHIC SERIES - VOLUME I, COAST OF OREGON,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 02L.
W71-12704

ENVIRONMENTAL FACTORS IN COASTAL AND ESTUARINE WATERS, BIBLIOGRAPHIC SERIES - VOLUME II, COAST OF WASHINGTON,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 02L.
W71-12705

THE USE OF SERRATIA INDICA AND BACILLUS SUBTILIS VAR. NIGER SPORES FOR TRACING SEWAGE DISPERSION IN THE SEA,
Water Pollution Research Lab., Stevenage (England).
E. B. Pike, A. W. J. Bufton, and D. J. Gould.
Journal of Applied Bacteriology, 32, p 206-216, 1969. 2 tab, 4 fig, 15 ref.

Descriptors: *Sewage effluents, *Dispersion, *Sea water, *Bacteria, *Spores, Tracer, Mortality, Water pollution sources, *Path of pollutants, Outlets.

Experiments were conducted at 2 coastal sites to evaluate the suitability of Serratia indica and spores of Bacillus subtilis var. niger for tracing offshore and longshore dispersion of sewage released from submarine outfalls. Neither organism was found in the waters studied prior to experimental releases. S. indica disperses in a similar fashion to coliaerogenes bacteria. Both tracer organisms were killed rapidly in seawater exposed to sunlight, but their mortality kinetics differed. Spores dispersed offshore similarly to K82Br and to S. indica; because of this and their stability, it was thought that they could be used to measure physical dilution independent of mortality. Continuous release of S. indica into the sea is suitable for measuring the pollution field around an outfall; adding single dose of either tracer yields information on dispersion processes and transit times to shore. (Goessling-Texas)
W71-12722

AN INVESTIGATION OF THE POTENTIAL PROBLEM OF INCREASING BORON CONCENTRATIONS IN RIVERS AND WATER COURSES,
Water Pollution Research Lab., Stevenage (England).
A. Waggott.
Water Research, Water Pollution Research Laboratory Reprint No. 573, 1969, Vol 3, p 749-765. 4 fig, 11 tab, 40 ref.

Descriptors: *Water pollution sources, *Boron, *Toxicity, Analytical techniques, Waste water treatment, *Pollutant identification, Pollution abatement.
Identifiers: Borax, Boric acid.

Sources of pollution by boron are considered and a brief account of the chemical properties of borax and boric acid is given. The literature dealing with boron toxicity in relation to water pollution is summarized. Methods for determining boron in natural waters are discussed and experiments to test the application of one of them to sewage and sewage effluents are described. Results of determination of boron in surface waters, sewages, sewage effluents, and industrial effluents are given and discussed. The insignificant removal of boron from sewage during normal treatment is demonstrated and other methods for reducing the boron content of waters are considered. It is concluded that the boron concentrations at present found in surface waters in the United Kingdom do not present an immediate toxicity problem. (Goessling-Texas)
W71-12724

ORGANO-CHLORINE INSECTICIDES IN WATER--PART II,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05A.
W71-12733

RADIOTRACER DISPERSION STUDIES IN THE VICINITY OF A SEWER OUTFALL,
Water Pollution Research Labs., Stevenage (England).
M. J. Barrett, A. R. Agg, and D. Munro.
Proceedings, International Conference on Advances in Water Pollution Research, 4th, Prague 1969. 14 p, 7 fig, 2 tab, 6 ref, Water Pollution Research Laboratory Reprint No. 580.

Descriptors: *Sewage effluents, *Mathematical model, *Dispersion, *Radioisotopes, Water pollution sources, *Path of pollutants, Outlets, Diffusion.

Identifiers: Fickian diffusion, Gamma scintillation counters.

A dispersion study was conducted for two successive summers in the vicinity of a sewage outfall some 400 m. offshore. The shoreline in the area was nearly straight and the sea-bed gradient fairly uniform. Bromine-82 was used as the radio-tracer in quantities ranging from 116 to 500 mCi. Specific gravity of the addition was adjusted with methyl alcohol. Dispersion was traced through the use of gamma scintillation counters. Values for the Joseph and Sendners modification of the classical Fickian diffusion equation were determined and tested. Fair agreement between predicted and observed values was obtained. Wind induced currents had a marked effect on the dispersion of the radiotracer. (Goessling-Texas)
W71-12734

WATER POLLUTION - 1970, PART 3.
United States Senate Committee on Public Works, Washington, D.C. Subcommittee on Air and Water Pollution.
For primary bibliographic entry see Field 05G.
W71-12767

WATER POLLUTION--1970 PART 4.
For primary bibliographic entry see Field 05G.
W71-12768

MATHEMATICAL SIMULATION OF DISPERSION OF POLLUTANTS IN A LAKE WITH ICE COVER,
Calgary Univ. (Alberta). Dept. of Chemical Engineering.
J. Stanislav, and M. F. Mohtadi.
Water Research, Vol 5, No 7, p 401-412, July 1971. 7 fig, 23 ref.

Descriptors: *Path of pollutants, *Iced lakes, *Dispersion, *Mathematical models, *Simulation analysis, Currents (Water), Water circulation, Water pollution effects, Mass transfer, Convection, Water temperature, Computer programs.

Mathematical simulation was used to predict the mode of dispersion of a pollutant stream entering a lake. The model is based on simplifying assumptions but it is versatile enough to allow the magnitude of dimensionless parameters, source terms and boundary and initial conditions to be altered. By imposing a laminar velocity distribution on the system the model can be used to simulate the dispersion pattern in a lake where there is a slow bulk flow. The method can be employed as a useful tool for the predictions of the extent of pollution in a lake. (Knapp-USGS)
W71-12797

A DISPERSION MODEL FOR A QUANTITATIVE STUDY OF A GROUNDWATER POLLUTION BY SALT,
National School of the Bridges and Roads, Paris (France).
J. J. Fried, and P. O. Ungemach.
Water Research, Vol 5, No 7, p 491-495, July 1971. 4 fig, 1 append.

Descriptors: *Mathematical models, *Path of pollutants, *Saline water, *Salts, *Mine wastes, Groundwater movement, Permeability, Malenclaves, Saline water-freshwater interfaces, Dispersion, Water quality.
Identifiers: Potash mining, Alsace (France).

Potash mining in Southern Alsace has created a great amount of salt wastes composed of NaCl (85%) and clays (15%). For many years these wastes have been piled in dumps in almost direct contact with the water table below. The old dumps still remain and, through rain water infiltration, pollute the aquifer. Geophysical and chemical measurements yield a description of the present state of pollution; to predict the evolution in time and space of the contaminated zone, a mathematical model takes into account the miscible displacement of sweet water by salt water and gravity effects due to the high salt concentration. (Knapp-USGS)
W71-12798

THE RESTORATION OF BEACHES CONTAMINATED BY OIL IN CHEDABUCTO BAY, NOVA SCOTIA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 05G.
W71-12802

UPTAKE OF MANGANESE-54 BY A BENTONITE CLAY IN SEA WATER,
R. E. Smith, and J. D. Gassaway.
Proceedings of the International Clay Conference, September 5-10, 1969, Tokyo, Japan, Volume 1; Israel Universities Press, Jerusalem, p 613-617, 1969. 1 fig, 2 tab, 6 ref.

Descriptors: *Water pollution sources, *Radioactive wastes, *Radioactive waste disposal, *Clays, *Saline water, Bentonite, Manganese, Analytical techniques, Water pollution control, Radioisotopes, Ion exchange.
Identifiers: *Manganese-54.

A bentonite clay was mixed with a seawater sample containing the radionuclide Mn-54 for different time periods ranging from 5 to 120 mins. The uptake of the Mn-54 by bentonite gave a typical Langmuir curve which approached equilibrium at 120 mins. During the experiments, a centrifugation time of 20 to 30 mins. was required for the extraction of the bentonite. (Woodard-USGS)
W71-12823

EFFECT OF MIXING ON OXYGEN UPTAKE RATE OF ESTUARINE BOTTOM DEPOSITS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
D. C. Martin, and D. A. Bella.
Journal Water Pollution Control Federation, Vol 43, No 9, p 1865-1876, September 1971. 8 fig, 3 tab, 17 ref. FWPCA Grant 16070 DGO.

Descriptors: *Bottom sediments, *Estuaries, *Oxygen demand, *Biodegradation, Biochemical oxygen demand, Benthos, Water chemistry, Path of pollutants, Mud-water interfaces, Sediment-water interfaces.
Identifiers: Oxygen uptake.

In a study of the oxygen uptake of estuarine bottom deposits, core samples were collected in sampling tubes in a manner that minimized disturbance of the samples, and uptake rates were measured under laboratory conditions and with various degrees of mixing. Higher levels of mixing resulted in higher oxygen-uptake rates. Oxygen-uptake rate was primarily the result of release of biodegradable substances from bottom material into overlying water. Oxygen demand of benthic gases seemed small. Depth of deposit, from 5 to 30 cm, had no effect on uptake. Change in concentration of matter suspended from surface of deposits had no apparent effect on the uptake rate of overlying waters. (Knapp-USGS)
W71-12835

OIL POLLUTION.
Environmental Protection Agency, Edison, N.J. Water Quality Lab.
For primary bibliographic entry see Field 05G.
W71-12836

UNSTEADY SPREAD OF BUOYANT SURFACE DISCHARGE,
Memorial Univ. of Newfoundland, St. John's. Dept. of Engineering.
J. J. Sharp.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, Paper 8396, p 1471-1492, September 1971. 10 fig, 4 tab, 20 ref, append.

Descriptors: *Mixing, *Jets, *Path of pollutants, *Hydraulic models, Hydraulic similitude, Model studies, Viscosity.
Identifiers: Buoyant jets.

A study was made of the spread which results from the discharge of a buoyant effluent at the free surface. Similitude methods were applied to develop functional equations for rate of spread, concentration, and shape, and experimental data are given for the rate of spread. Previously published data demonstrate the validity of the derived equations and show how comprehensive mixing diagrams can be prepared by logical experimentation. Methods of choosing scales for hydraulic models are considered, as well as the effect of viscous influence on the available choice of methods. (Knapp-USGS)
W71-12839

THE UPTAKE AND DISTRIBUTION OF MANGANESE-54 BY CHARA BRAUNII IN A FRESHWATER SYSTEM,
Tufts-Delta Health Center, Mound Bayou, Miss.
Andrew James, James Kereiakes, and Pasquale V. Scarpino.
J Environ Health. 32 (3): 312-315. Illus. 1969.
Identifiers: Chara-Braunii, Distribution, Fresh, Manganese-54, System, Uptake, Water.

Results of this study support Chara as an indicator of radioactive contamination in freshwater systems. Criteria for an ideal indicator entity in a biological system are discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12924

SEWER AND DRAIN SWABBING AS A MEANS OF INVESTIGATING SALMONELLOSIS,
University Hospital of Wales, Cardiff.
R. W. S. Harvey, and T. H. Price.
J Hyg. 68 (4): 611-624, 1970.
Identifiers: Cardiff, Drain, Food, Human, Pig, Potential, Poultry, Salmonellosis, Sewer, Swabbing, United-Kingdom, Vector, Wales.

The use of gauze swabs in drains or sewers to clarify the path followed by a Salmonella from source to human host is reviewed in the light of experience gained in Cardiff over 15 yr. This period saw a marked change in attitudes to Salmonella epidemiology, in that infected food is now regarded as of greater importance than infected food handlers. In these 15 yr, butchers, abattoirs and knackers' yards, markets and bakehouses were monitored. In the bakehouse survey, staff infection was demonstrated by sewage examination. Sewage investigation was also used to show frequent entry of salmonellas into households. The area was carefully chosen to exclude salmonellas from industrial sources and shops. The frequent finding of infection in this sewage implies that a commonly consumed heavily infected food item is involved. The wide range of serotypes isolated suggests an animal usually fed on infected animal feed. Poultry and pigs are put forward as animals liable to spread salmonellosis to man. Clarification of the Salmonella pathway may eventually lead to measures likely to prevent the transmission of infection to man. Swabs placed in abattoir drains serve as an economical method of obtaining warning of a persistent build-up of contamination. The persistence of a serotype in an abattoir is not infrequently followed by human infection.--Copyright 1971, Biological Abstracts, Inc.
W71-12935

INTRATYPIC DIFFERENTIATION OF POLIOVIRUS STRAINS ISOLATED FROM SEWAGE: CONSEQUENCES FOR THE PRACTICE OF ORAL VACCINATION,
Institut fuer Medizinische Mikrobiologie, Essen (Germany).
E. Kuwert, P. G. Hoeher, and C. A. Primavesi.

Zentralbl Bakteriol Parasitenk Infektionskrankh Hyg Abt I Orig. 215 (1): 16-25, 1970 (Engl summ).
Identifiers: Children, Differentiation, Epidemic, Intra, Isolated, Oral, Poliovirus, Sewage, Strains, Typic, Vaccination.

Thirty-five poliovirus strains isolated from sewage lines before, during and after the outbreak of a small poliomyelitis (type 1) epidemic in Gelsenkirchen-Essen in 1968 were characterized by 3 different methods of intratypic differentiation (rct/40 deg -, MSand seromarker), and the results correlated to the course of the disease and its control by oral vaccination. Virulent poliovirus, type 1, could be isolated 9 days before the 1st clinical case became evident. A total of 22 children aged 1-14 yr and 1 adult with no previous vaccination record exhibited neurological symptoms which slowed down significantly after trivalent oral emergency vaccination. The last neurological case occurred 2-3 wk after the beginning of the vaccination campaign. Trivalent oral vaccination proved highly effective for control of the disease. Observations emphasize the value of isolation and intratypic characterization of poliovirus strains from sewage lines as a potent tool in the poliomyelitis surveillance program. Regular control of sewage during summertime and fall affords early recognition of an imminent poliomyelitis epidemic. Emergency oral vaccination should be performed as soon as possible after the occurrence of only 1 clinical case and repeated isolation of virulent virus from sewage lines.--Copyright 1971, Biological Abstracts, Inc.
W71-12936

ORGANIC MATERIALS DECOMPOSITION FROM HILL SOILS AND PASTURES: IV. EFFECTS OF MOISTURE CONTENT ON MINERALIZATION OF CARBON, NITROGEN AND PHOSPHORUS FROM PLANT MATERIALS AND SHEEP FAECES,
Hill Farming Research Organization, Edinburgh (Scotland).
M. J. S. Floate.
Soil Biol Biochem. 2 (4): 275-283, Illus, 1970.
Identifiers: Accumulation, Agrostis-M, Ammonia, Ammonium, Carbon, Decomposition, DI, Evolution, Faeces, Festuca-M, Gaseous, Hill, Materials, Mineralization, Moisture, Nardus-M, Nitrogen, Organic, Oxide, Pastures, Phosphorus, Plant, Sheep, Soils.

Variation in moisture content resulted in minor changes in the evolution of CO2 during the incubation of plant materials and sheep feces from Nardus and Agrostis-Festuca hill pastures. After 12 wk less CO2 was produced at 25% moisture-holding capacity (MHC) than at 50 or 100% MHC. Mineral-N production from plant materials was little affected by moisture but with sheep feces, the accumulation of ammonium, and the evolution of gaseous ammonia were greatest at 100% MHC. At 25% MHC the production of mineral-N from feces was almost completely inhibited. The immobilization of P by plant materials was reduced at 25% MHC and mineral-P production from sheep feces was slightly enhanced.--Copyright 1971, Biological Abstracts, Inc.
W71-12938

THE INFLUENCE OF MOISTURE ON THE STRUCTURE AND QUALITY OF NH4NO3-PRILLS,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Chemical Technology.
Christer Sjolin.
J Agr Food Chem. 19 (1): 83-95, Illus, 1971.
Identifiers: Ammonium, Dimensional, Fertilizer, Moisture, Nitrate, Prills, Stability, Structure.

A study was made of high density ammonium nitrate prills with additives of 1 wt% Al2 (SO4)3 and 2 wt% Mg (NO3)2. The additives are not homogeneously located in the prills. The Mg (NO3)2 additive is located in veins between the crystallites and contains 2 to 6 moles of water of crystallization. The Al2 (SO4)3 additive is located in small aggregates, diameter 1 to 10 micro, with the formula Al2 (SO4)3 (NH4)2 (OH)2 (H2O)6-10. The better dimensional stability is principally due to the additive taking up moisture from the surrounding ammonium nitrate bulk which results in a water-content low enough (less than 0.01%) to prevent phase transitions at 32 deg C.--Copyright 1971, Biological Abstracts, Inc.
W71-12939

POLYNUCLEAR AROMATIC HYDROCARBONS IN THE WATER ENVIRONMENT,
Pittsburgh Univ., Pa. Graduate School of Public Health.
Julian B. Andelman, and Michael J. Suess.
Bull W H O. 43 (3): 479-508. 1970. (Fr. summ.).
Identifiers: Animal, Aromatic, Benzpyrene, Carbons, Carcinogen, Environment, Human, Hydro, Nuclear, Plant, Poly, Water.

Many polynuclear aromatic hydrocarbons (PAH) are known to be carcinogenic to animals and probably to man. Carcinogenic and noncarcinogenic PAH in the water environment are reviewed, with emphasis on 3,4-benzpyrene (BP) because it is ubiquitous, is 1 of the most potent carcinogens and is widely studied. Although PAH are formed in combustion and other high-temperature processes, there is also evidence for their endogenous formation in plants, which may explain their ubiquity therein. Although the solubility of these compounds in pure water is very low, they may be solubilized by such materials as detergents or they may otherwise occur in aqueous solution associated with or adsorbed on to a variety of colloidal materials or biota, and thereby be transported through the water environment. A notable characteristic of PAH is their sensitivity to light. PAH were found in industrial and municipal waste effluents, and occur in soils, groundwaters and surface waters, their sediments and biota. With the exception of filtration or sorption by activated carbon, conventional water treatment processes do not efficiently remove them, and they were found in domestic water supplies. Because of the ubiquity of PAH in the environment, it is impossible to completely prevent man's exposure to them. Their surveillance should be continued and their concentrations in the environment should be reduced where practicable.--Copyright 1971, Biological Abstracts, Inc.
W71-12977

PORTABLE DRILLING CORP V. GUINN (DAMAGE TO AGRICULTURAL LAND FROM ADJACENT OIL WELL).
For primary bibliographic entry see Field 06E.
W71-13000

INTERNATIONAL COOPERATIVE STUDY OF ORGANOCHLORINE PESTICIDE RESIDUES IN TERRESTRIAL AND AQUATIC WILDLIFE, 1967/1968,
Freshwater Fisheries Lab., Pitlochry (Scotland).
A. V. Holden.
Pestic Monit J. 4 (3): 117-135. 1970.
Identifiers: Aquatic, Chicken, Chlorine, Clupea-Sprattus, Contamination, Cooperative, Dogfish, Egg, Environmental, Homogenates, International, Mussel, Organo, Pesticide, Pike, Residues, Sampling, Starling, Terrestrial, Wildlife.

A two-part collaborative study of organochlorine residues in wildlife was carried out by 17 laboratories in 11 countries. The 1st part involved the analysis of 4 test samples containing organochlorine residues; 1 sample was a solution of standard chemicals, while the other three were cod-liver oil, chicken egg, and sprat (Clupea-sprattus) homogenate. This part provided a basis for comparison of the relative efficiency and accuracy of the laboratories in residue analysis. The 2nd part of the program consisted of the sampling and analysis of four species of wildlife from areas believed to be free of pesticide usage in each country. The results indicate the degree of background contamination of the environment, as exemplified by the species selected, which were the starling, pike, marine mussel, and dogfish. The range of variation of residues among individuals of a natural population is much larger than that due to analytical errors or to differences between laboratories. Distributions within populations are non-Gaussian, necessitating large samples for the detection of relatively small interpopulation differences.--Copyright 1971, Biological Abstracts, Inc.
W71-13029

POLLUTION FROM ABANDONED MINES.
For primary bibliographic entry see Field 06E.
W71-13033

CAUSES OF OIL SPILLS FROM SHIPS IN PORT,
California Dept. of Fish and Game, Sacramento.
For primary bibliographic entry see Field 05G.
W71-13059

SOURCES AND BIODEGRADATION OF CARCINOGENIC HYDROCARBONS,
Scripps Institution of Oceanography, San Diego, Calif.
For primary bibliographic entry see Field 05G.
W71-13085

A HOT WATER FLUIDIZATION PROCESS FOR CLEANING OIL-CONTAMINATED BEACH SAND,
California Univ., Santa Barbara; and Standard Oil Co. of California, San Francisco.
For primary bibliographic entry see Field 05G.
W71-13093

5C. Effects of Pollution

MODEL STUDY TO PREDICT SALT DISTRIBUTION AND CONCENTRATION OF WATER IN SOIL PROFILES,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02G.
W71-12247

BIOLOGICAL EFFECTS OF OIL POLLUTION IN THE SANTA BARBARA CHANNEL,
University of Southern California, Los Angeles.
Dale Straughan.
Coastal Research Notes, Vol 3, No 5, p 11-17, June 1971. 7 p, 20 ref.

Descriptors: *Water pollution effects, *Oily water, *Ecology, *Environmental effects, *California, Biological properties, Surface waters, Bays, Channels, Investigations, Plankton, Benthos, Fish, Birds.
Identifiers: *Oil spills (Santa Barbara Channel).

An investigation was made to assess the effects on marine life of the oilwell blowout which occurred in the Santa Barbara Channel in January 1969. The study was continued over a twelve month period to determine not only the immediate effects of the oil pollution but also possible longer-term hazards. The area has numerous natural oil seeps and the oil spill occurred during a period of abnormally heavy rains. These factors, as well as human activity on the beaches, complicated interpretation of the results of the study. Three main points emerge from assessment of the data: (1) It is often difficult to isolate the effects of oil pollution from other phenomena. (2) Damage to flora and fauna in the Santa Barbara Channel was much less than predicted. (3) The area is recovering well. (Woodard-USGS)
W71-12262

OCEAN DUMPING. A NATIONAL POLICY.
Council on Environmental Quality, Washington, D.C.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Prince $10.55. A Report to the President, October 1970. 45 p, 4 fig, 18 tab, 72 ref, 2 append.

Descriptors: *Waste disposal, *Sewage disposal, *Disposal, *Waste dumps, *Water pollution control, *Pollution abatement, *Water allocation (Policy), *Water policy, Waste assimilative capacity, Water utilization, Ultimate disposal, Reasonable use, Environmental sanitation, Public health, Water resources, Oceans.
Identifiers: Dumping, Recommendations.

This report was made persuant to President Nixon's April 15, 1970 message to the Congress, in which he ordered a comprehensive study to result in research and in legislative and administrative recommendations relative to ocean dumping. The report discusses the sites, amounts, composition and effects of these wastes on the marine environment. Alternatives to this dumping are outlined in terms of costs, availability and effectiveness, and international implications of ocean dumping are considered. State and federal agencies and other authorities that deal with specific aspects of dumping are reviewed. The council recommends strict regulation of dumping practices and increased research into the effects of pollutants. (LeGore-Washington)
W71-12295

THE EFFECT OF A SUBLETHAL CONCENTRATION OF LAS ON THE ACUTE TOXICITY OF VARIOUS PHOSPHATE PESTICIDES TO THE FATHEAD MINNOW (PIMEPHALES PROMELAS RAFINESQUE),
Syracuse Univ., Research Corp., N.Y. Life Sciences Div.
J. M. Solon, and J. H. Nair, III.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 5, 1970. 4 tab, 5 ref. NIH Grant no. ES00213-03.

Descriptors: *Pesticides, *Organophosphorous pesticides, *Pesticide toxicity, *Alkylbenzene sulfonates, *Surfactants, *Water pollution effects, Bioassay, Agricultural chemicals, Lethal limit, Pesticide kinetics, Minnows, Fish physiology, Fish diseases, Detergents, Chlorinated hydrocarbon pesticides.
Identifiers: *Synergism, *Antagonism, Parathion, Methyl parathion, Ronnel, Dicapthon, Guthion, Trithion, EPN, Trichloronat, Pimephales sp.

Continuous flow bioassays were run to challenge fathead minnows (Pimephales promelas) with eight phosphorous insecticides, both in the presence and in the absence of linear alkyl benzene sulfonate detergent (LAS). The pesticides used were from the phosphorothionate (parathion, methyl parathion, ronnel, dicapthon), the phosphorodithioate (guthion, trithion), and the phosphonothionate (EPN, trichloronat) groups. LAS-pesticide synergism was noted with representatives from each pesticide group, but no consistent relationship between synergistic activity and pesticide structure was discerned. Mechanisms of toxicant synergism are suggested. (LeGore-Washington)
W71-12296

SURVIVAL AND GROWTH OF GOLDFISH AND CARP IN DILUTE SOLUTIONS OF COPPER SULPHATE (IN JAPANESE),
Tokyo Univ of Fisheries (Japan).
Hisao Ozaki, Kazuo Uematsu, and Koji Tanaka.
Japanese Journal of Ichthyology, Vol 17, No 4, p 166-172, December 1970. 2 fig, 4 tab, 11 ref.

Descriptors: *Copper sulfate, *Metals, *Copper compounds, *Pesticides, *Carp, Water pollution effects, Bioassay, Lethal limit, Environmental effects, Inorganic compounds, Sulfates, Fish physiology, Aquatic environment, Resistance, Toxicity, Growth rates, Food habits, Fish diseases.
Identifiers: *Goldfish, *Chronic pollution, Low-level effects.

Subacute and chronic intoxication of copper sulfate on goldfish and carp were tested under lower concentrations than those in usual cases of TLm tests of 24 or 48 hr. Parameters noted were the maximum and minimumperiods of survival (days), the growth in length and weight, the condition factor, and the amount of food consumed. Also, seven kinds of copper compounds were examined relative to the survival (in hours) of carp. The concentrations which permitted the survival for more than 30 days were maxima of 0.17 ppm for goldfish, and 0.08 ppm for carp, and the minimum concentrations causing growth decreases were 0.08 ppm for goldfish and 0.024 ppm for carp. The authors stress the superior validity of long-term, chronic bioassays, as opposed to acute bioassays. (LeGore-Washington).
W71-12297

TOXICITY OF SOME COMPOUNDS TO STRIPED BASS FINGERLINGS,
Bureau of Sport Fisheries and Wildlife, Auburn, Ala.
T. L. Wellborn, Jr.
The Progressive Fish-Culturist, Vol 33, No 1, p 32-36, January 1971. 2 tab, 24 ref.

Descriptors: *Toxicity, *Striped bass, *Lethal limit, *Fish management, *Aquiculture, Bioassay, Fish physiology, Physiological ecology, Water pollution effects, Sea basses, Environmental effects, Fishkill, Fish diseases, Fry, Juvenile fishes.
Identifiers: Chemical effects, Acriflavine, Aquathol, Bayluscide, Casoron, Co-Ral, Lindane, Malachite green oxalate, Malathion, Terramycin.

The effects are discussed of several chemicals that have been suggested for use in the propagation of the striped bass (Morone saxatilis). Fingerlings were challenged in static bioassay with acriflavine, aquathol, bayluscide, casoron, co-ral, lindane, malachite green oxalate, malathion, and terramycin concentrate. Malachite green oxalate was most acutely toxic, with a 24 hr LC50 of 0.30 mg/l. Lindane and malathion had 96 hr LC50's of 0.40 and 0.24 mg/l respectively. Casoron (96 hr LC50 — 6,200 mg/l) and aquathol (96 hr LC50 — 710 mg/l) were least toxic. (LeGore-Washington)
W71-12299

VERTEBRATE INSECTICIDE RESISTANCE: THE IN VITRO ENDRIN EFFECT ON SUCCINIC DEHYDROGENASE ACTIVITY ON ENDRIN-RESISTANT AND SUSCEPTIBLE MOSQUITOFISH,
Mississippi State Univ., State College. Dept. of Zoology.
James D. Yarbrough, and Marion R. Wells.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 2, p 171-176, 1971. 3 tab, 9 ref.

Descriptors: *Resistance, *Chlorinated hydrocarbon pesticides, *Endrin, *Pesticide toxicity, *Enzymes, *Inhibitors, Path of pollutants, Fish physiology, Biochemistry, Environmental effects.
Identifiers: *Mechanisms of toxicity, Mitochondria, Succinic dehydrogenase, Gambusia sp., Mosquitofish.

Preliminary data are presented on the effect of endrin on succinic dehydrogenase activity of liver and brain homogenates from endrin-resistant and endrin-susceptible mosquitofish (Gambusia affinis). Endrin was capable of enzyme inhibition in resistant tissue only after the mitochondrial membrane was disrupted, implying that a membrane barrier is effective in the resistance mechanism. The authors note that this phenomenon might also indicate a general action of organochlorine compounds, involving disruption of cellular function in all organs as opposed to a direct and unique involvement of the central nervous system. (LeGore-Washington)
W71-12301

A PROPOSAL: EXCHANGE EQUILIBRIA CONTROL THE DEGREE CHLORINATED HYDROCARBONS ARE BIOLOGICALLY MAGNIFIED IN LENTIC ENVIRONMENTS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
Jerry L. Hamelink, Ronald C. Waybrant, and Robert C. Ball.
Transactions of the American Fisheries Society, Vol 100, No 2, p 207-214, April 1971. 5 fig, 2 tab, 33 ref.

Descriptors: *Path of pollutants, *Water pollution effects, *DDT, *Chlorinated hydrocarbon pesticides, *Pesticide kinetics, *Lentic environments, *Fish physiology, Pesticides, Pesticide residues, Pesticide toxicity, Physiological ecology, Aquatic environment, Food chains, Absorption.
Identifiers: *Concentration mechanisms, Biological magnification, DDD, DDE.

The dynamics of DDT in lentic environments were studied in a farm pond and in four artificial pools. A hypothesis that magnification of pesticides was dependent on passage of the residues through a food chain was rejected and a hypothesis that accumulation depends on absorption and solubility differences was proposed. The mechanism proposed is based on the principle that compounds are exchanged between water and fats. Exchange in fish passes through two stages, from water to blood and from blood to fats, permitting a high degree of magnification in fish. The proposed mechanism accounts for the reported observations that pesticides are excreted by fish, that body load of pesticides increases as the fat content of the fish increases, that pesticide magnification by fish is inverse to the water solubility of the compounds, and that pesticides persist longer in oligotrophic than eutrophic lentic ecosystems. (LeGore-Washington)
W71-12302

DDT UPTAKE AND GROWTH OF EUGLENA GRACILIS,
National Research Council of Canada, Ottawa (Ontario). Div. of Biology.
H. W. de Koning, and D. C. Mortimer.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 3, p 244-248, 1971. 2 fig, 2 tab, 3 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *DDT, *Pesticide toxicity, *Water pollution effects, Pesticides, Agricultural chemicals, Pesticide residues, Pesticide kinetics, Animal physiology, Plant physiology, Physiological ecology, Bioassay, Microorganisms, *Euglena, Algae.

The effect of DDT on the growth rate of Euglena gracilis and the rate of DDT uptake by actively growing E. gracilis cultures were examined. DDT suppressed growth when added in 1.0 ml of ethanol, but had no effect when added alone or in 0.1 ml of ethanol. The inhibited cultures recovered after 3 days, probably after utilization of the EtOH. DDT accumulation has no observable effect on cell division, and no intracellular degradation products of DDT were detected. (LeGore-Washington)
W71-12303

FISH BIOASSAYS CONTRASTING CONSTANT AND FLUCTUATING INPUT OF TOXICANTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology and Kansas Univ., Lawrence. Dept. of Zoology.
John Cairns, Jr., William T. Waller, and Jerry C. Smrchek.
Revista de Biologia, Vol 7, No 1-2, p 75-91, 1969. 18 fig, 1 tab, 2 ref.

Descriptors: *Water pollution effects, *Metals, *Effluents, *Discharge (Water), Bioassay, Shiners, Physiological ecology, Environmental effects, Aquatic environment, Sanitary engineering, Waste water disposal, Safety factors.
Identifiers: *Zinc, Goldfish.

The response was determined of fish to zinc concentrations at or near the 96 hr TLm value when the contaminant is introduced periodically at (1) a constant rate, and (2) a varying rate. Static bioassays were utilized. Although results were not uniform, for practical purposes one might assume that all input patterns produced essentially similar results. It should not be assumed that any substantial safety factor results from occasional reductions in contaminant concentration, even if they last as long as 24 hours. (LeGore-Washington)
W71-12304

EFFECTS OF SYNTHETIC SURFACTANTS ON THE LARVAE OF CLAMS (M. MERCENARIA) AND OYSTERS (C. VIRGINICA),
Bureau of Commercial Fisheries, Milford, Conn. Biological Lab.
H. Hidu.
Journal of the Water Pollution Control Federation, Vol 37, No 2, p 262-270, February 1965. 7 tab, 12 ref.

Descriptors: *Water pollution effects, *Detergents, *Growth rates, *Larval growth stage, *Surfactants, Bioassay, Clams, Oysters, Aquatic environment, Impaired water quality, Toxicity, Water quality, Environmental effects, Eggs, Larvae, Water softening, Resistance, Lethal limit, Alkylbenzene sulfonates, Ions, Mortality.
Identifiers: *Endangered resources, Crassostrea sp., Mercenaria sp., Alkyl aryl sulfonates, Alkyl sulfates.

Toxic concentrations of eight surfactant compounds on the larvae of clams (Mercenaria mercenaria) and oysters (Crassostrea virginica) have been determined. Of the eight surfactants, four were anionic, two were cationic, and two were nonionic. Development of fertilized eggs and growth and survival of fully formed veliger larvae were reduced by surfactant concentrations of 0.01-5.00 mg/l of active ingredient. The cationic compounds were most toxic, and the nonionic compounds were least toxic. In general, oyster larvae were harmed by lower toxicant concentrations than were clam larvae. The levels determined to be harmful have been reported elsewhere as being already present in some important shellfish rearing areas. (LeGore-Washington)
W71-12307

OPEN SEAWATER SYSTEM WITH CONTROLLED TEMPERATURE AND SALINITY,
Bureau of Commercial Fisheries, Beaufort, N.C., Center for Estuarine and Menhaden Research.
W. F. Hettler, Jr., R. W. Lichtenheld, and H. R. Gordy.
The Progressive Fish-Culturist, Vol 33, No 1, p 3-11, January 1971. 4 fig, 1 tab, 2 ref.

Descriptors: *Equipment, *Sea water, *Water quality, *Water supply, *Water quality control, Bioassay, Research facilities, Research equipment, Laboratory equipment, Water temperature, Salinity, Turbidity, Aquaria.
Identifiers: *Aquarium facilities, *Seawater system.

An 'open' seawater system is described in which temperature, salinity and turbidity can be controlled. Seawater is pumped from submerged filters into two large reservoirs to provide a constant delivery pressure and to furnish reserve water when pumping is temporarily stopped. From these storage reservoirs, filtered seawater flows into secondary reservoirs, where temperature and salinity are adjusted. Processed water is then available for delivery, by gravity flow, into the laboratory. Specifics of the system, which is used at the National Marine Fisheries Service Laboratory at Beaufort, North Carolina, are described. Sources of the major components are included. (LeGore-Washington)
W71-12308

EFFECTS OF REARING TEMPERATURE ON GROWTH, BODY FORM, AND HEMATOLOGY OF FALL CHINOOK FINGERLINGS,
Bureau of Sport Fisheries and Wildlife, Longview, Wash. Salmon-Cultural Lab.
J. L. Banks, L. G. Fowler, and J. W. Elliott.
The Progressive Fish-Culturist, Vol 33, No 1, p 20-26, January 1971. 3 fig, 1 tab, 11 ref.

Descriptors: *Water temperature, *Chinook salmon, *Growth rates, *Thermal stress, *Fish physiology, Bioassay, Bioindicators, Water pollution effects, Resistance, Temperature, Heat resistance, Aquatic environment, Physiological ecology, Dimensions, Thermal pollution, Pollutants, Fry, Juvenile fishes.
Identifiers: *Hematology, Fish hematology, Body dimensions, Blood, Oncorhynchus sp.

Effects of four rearing temperatures (50, 55, 60 and 65 F) were compared relative to growth, body form and hematological characteristics of fall chinook salmon (Oncorhynchus tshawytscha) fingerlings. A temperature of 60 F appeared closest to optimum, as weight gains were consistently greater at this temperature than at 50 or 55 F. Rearing temperatures had no effect on body conformation, indicating that reasonable accuracy may be assumed in calculating fork length from average weight. Temperature effects on physiological characteristics were found only in fish averaging 4 gm or less. Increased corpuscular counts, hematocrits and hemoglobin levels in these fish were associated with increased rearing temperatures. Hematological and chemical characteristics of all fish were within the ranges of normal values previously observed in other chinook fingerlings. No physiological indications of temperature-induced stress were found. (LeGore-Washington)
W71-12309

THE EFFECT OF PARAQUAT ON FISH IN A COLORADO FARM POND,
Bureau of Sport Fisheries and Wildlife, Tiburon, Calif. Fish-Pesticide Research Lab.
R. D. Earnest.
The Progressive Fish-Culturist, Vol 33, No 1, p 27-31, January 1971. 3 tab, 5 ref.

Descriptors: *Herbicides, *Paraquat, *Lethal limit, *Sunfishes, *Catfishes, *Trout, *Fishkill, Pesticides, Aquatic weed control, Fish physiology, Bioassay, Water pollution effects, Toxicity, Fish diseases, Mortality, Fish parasites, Environmental effects, Fish behavior, Physiological ecology.
Identifiers: Fish histopathology.

The effects of a herbicide, paraquat (1,1'-dimethyl-4,4'-dipridylium dimethyl sulfate), on the flora and fish of a farm pond were evaluated. Active cation was spread over the pond to achieve a 1.14 mg/l concentration. At least 34% of stocked bluegills died within 48 hr of the treatment, and others probably died without being recovered. Catfish appeared to be resistant to the level of paraquat used. The alga, Chara sp., was almost eliminated within 16 days, and Spirogyra sp. was reduced. The latter, however, was again plentiful three months later. (LeGore-Washington)
W71-12310

A FISH RESPIROMETER,
California State Coll. Los Angeles. Dept. of Zoology.
H. S. Sethi.
The Progressive Fish-Culturist, Vol 33, No 1, p 60-61, January 1971. 1 fig.

Descriptors: *Water pollution effects, *Respiration, *Fish physiology, *Oxygen requirements, *Laboratory equipment, Physiological ecology, Environmental effects, Oxygen demand, Metabolism, Research equipment.
Identifiers: *Respirometers.

A fish respirometer that can impose precise water velocities, and which can be placed in a test chamber through which water flows at a desired temperature is described. The system utilizes 3.5 liters of recirculating water, and the technique involves the sampling of water before and after stress is applied to the fish. The Alsterberg azide modification of the Winkler method was routinely used to determine oxygen content of the water. (LeGore-Washington)
W71-12311

TOLERANCE OF HIGH TEMPERATURES BY SOME INTERTIDAL BARNACLES,
University Coll. of North Wales, Bangor. Marine Labs.
B. A. Foster.
Marine Biology, Vol 4, No 4, p 326-332, December 1969. 5 fig, 1 tab, 21 ref.

Descriptors: *Water pollution effects, *Thermal pollution, *Water temperature, *Lethal limit, *Thermal stress, Temperature, Seasonal, Resistance, Pollutants, Bioindicators, Bioassay, Heat resistance, Aquatic environment, Animal physiology, Thermal water, Heated water.
Identifiers: *Chronic effects, *Barnacles, Upper lethal temperature, Balanus sp., Elminius sp.

The median lethal times of survival of the barnacles Elminius modestus, Balanus crenatus and B. balanoides, when continuously submerged at high temperatures, were determined for individuals collected both in the summer and in the winter. In E. modestus and B. crenatus there was no seasonal change in high temperature tolerance. In B. balanoides, however, the adults were more susceptible in the winter than in the summer to temperatures below the upper lethal temperature. Using less comprehensive data for other British species of barnacles, it is concluded that, in general, the order of tolerance to high temperatures corresponds to the order of temperatures within the geographical and the intertidal distributions of the species. From the time-temperature-survival curves, intertidal barnacles are living closer to environmental temperature limits than would be supposed solely on the basis of the measurement of the upper lethal temperature. (LeGore-Washington)
W71-12313

EFFECTS OF TURBIDITY-PRODUCING SUBSTANCES IN SEA WATER ON EGGS AND LARVAE OF THREE GENERA OF BIVALVE MOLLUSKS,
Bureau of Commercial Fisheries, Milford, Conn. Biological Lab.
H. C. Davis, and H. Hidu.
The Veliger, Vol 11, No 4, p 316-323, April 1, 1969. 7 fig, 2 tab, 6 ref.

Descriptors: *Turbidity, *Water pollution effects, *Growth rates, *Environmental effects, *Larval growth stage, Aquatic environment, Impaired water quality, Water quality, Suspension, Bioassay, Eggs, Larvae, Particle size, Clays, Dusts, Silts, Sediment load, Suspended load, Oysters, Clams, Kaolinite.
Identifiers: *Silicon dioxide, Crassostrea sp., Ostrea sp., Mercenaria sp., Fuller's earth, Survival.

As little as 0.188 g/l of silt caused a significant decrease in the percentage of American oyster (Crassostrea virginica) eggs developing normally, as did 3 g/l of kaolin (silt, clay) or 4 g/l of Fuller's earth (dusting powder). The percentages of oyster eggs developing normally was not affected by concentrations of silicon dioxide of 4 g/l, regardless of particle size. Clam eggs were affected only at 4 g/l of the smallest particles (less than 5 microns). These smallest particles of silicon dioxide had, however, the greatest effect on survival and growth of clam and oyster larvae. Larger particles (5-25 microns and 25-50 microns) had little effect on survival of either species or on growth of clam larvae. Growth of oyster larvae decreased progressively as the size of silicon dioxide particles was decreased. Bivalve larvae grew faster in low concentrations of turbidity-producing substances than in clear sea-

water, possibly because the suspended particles chelate or adsorb toxins present in larval cultures. (LeGore-Washington)
W71-12314

QUALITATIVE CHANGES IN THE FISH-FAUNA OF THE UPPER NEOSHO RIVER SYSTEM, 1952-1967,
F. B. Cross, and M. Braasch.
Transactions of the Kansas Academy of Science, Vol 71, No 3, p 350-360, 1968. 1 fig, 1 tab, 6 ref.

Descriptors: *Kansas, *Water pollution effects, *Fishkill, *Stream pollution, *Impaired water quality, *Fish populations, On-site investigations, Water pollution, Water quality, Water pollution sources, Stream fisheries, Resistance, Water law, Fish conservation, Aquatic environment.
Identifiers: *Neosho River Kansas, *Stream decline, *Biotic destruction, Species diversity.

A comparison of species lists obtained in extensive collections from the upper Neosho River system (Kansas) in 1952 and in 1967 indicates rapid deterioration of the fish fauna. Losses in diversity were greatest in the mainstream of the Cottonwood-Neosho River, where numerous fish kills occurred in 1966 and 1967. Most fish kills were attributed to pollution by cattle feedlot wastes. Five fish species found frequently in 1952 were not found at any of 24 localities investigated in 1967. At least 20 species declined in abundance in the 15 year interval. Species found more frequently in 1967 than in 1952 are vagile kinds that inhabit the recently constructed John Redmond Reservoir on the Neosho River, species introduced since 1952, and kinds whose surface-dwelling habit enhances their resistance to organic pollution. If laws passed by the State Legislature in 1967 are strictly enforced, pollution and the number of fish kills will be decreased. (LeGore-Washington)
W71-12315

DECREASE IN DDT RESIDUES IN YOUNG SALMON AFTER FOREST SPRAYING IN NEW BRUNSWICK,
Guelph Univ. Guelph (Ontario); and Fisheries Research Board of Canada, St. Andrews (New Brunswick); and Prince Edward Island Univ., Charlottetown.
J. B. Sprague, P. F. Elson, and J. R. Duffy.
Environmental Pollution, Vol 1, p 191-203, 1971. 2 fig, 2 tab, 29 ref.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Salmon, *Pesticide residues, Pesticide kinetics, Path of pollutants, Physiological ecology, Atlantic salmon, Juvenile fishes, Bioassay, Residues, Pesticide drift, Pollutants, Environmental effects.
Identifiers: DDE, Salmo sp., Salmon parr.

DDT residues were measured in Atlantic salmon parr (Salmo salar) collected from streams which had been subjected to aerial forest spraying in preceeding months or years. Six months after spraying, surviving salmon had averages of 0.5 to 2.0 ppm DDT in their whole bodies, and 2.0 to 4.0 ppm DDE. Slightly higher concentrations have been associated with declines in fisheries in other places. In 2.5 years or less after spraying, DDT decreased to low or undetectable concentrations. DDE, the common metabolite, decreased slowly during 12.5 years. The relationship of total amount (y) in ppm, of all DDT residues, to the time (t) in years since the river was last sprayed, was simply described as: $y = 1.91/t$. Total residue showed little or no relationship to other aspects of spray history, such as strength of DDT mixture applied, or total number of yearly sprayings received by the river. Salmon parr from a Nova Scotia river with no spray-history had undetectable or trace amounts of DDT residues, a relatively uncommon finding in recent years. (LeGore-Washington)
W71-12317

DDT RESIDUES IN CANADIAN ATLANTIC FISHES AND SHELLFISHES,
Fisheries Research Board of Canada, St. Andrews (New Brunswick); and Prince Edward Island Univ. Charlottetown.
J. B. Sprague, and J. R. Duffy.
Journal of the Fisheries Research Board of Canada, Vol 28, No 1, p 59-64, 1971. 1 fig, 1 tab, 16 ref.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Public health, Agricultural chemicals, Path of pollutants, Bioindicators, Fish, Lobsters, Shellfish, Mollusks, Salmon, Absorption.
Identifiers: Canada, DDD, DDE, Mackeral, Cod, Hake, Flounder.

Compared with the same or similar species elsewhere in North America and northern Europe, DDT residues were average or less than average in lobsters, five species of mollusks, and seven species of finfishes from estuarine and coastal waters of New Brunswick and Prince Edward Island. Mackerel had the highest residues, averaging 0.38 ppm of DDT or 0.54 ppm of DDT plus metabolites. These levels do not seem to be an immediate danger to the fish. In terms of human diet, residues in mackeral are as high as those in some beef. The other species averaged 0.1 ppm of less of total DDT residue in the whole body or muscle, usually much less. This is relatively low by present day findings. Viscera of salmon, cod, and hake had 6-15 times higher concentrations of DDT residues than did muscle. Flounder viscera had no more residue than did muscle, whereas lobster eggs has nine times as much as did muscle. None of the four sampling locations produced consistently higher residues than the others. (LeGore-Washington)
W71-12318

MIXING STUDIES ASSOCIATED WITH THERMAL POLLUTION,
Maryland Univ., College Park. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 05B.
W71-12328

CHAPTER 4. SELF-PURIFICATION IN NATURAL WATERS,
Ecoscience Lab., Norwich, Conn.
For primary bibliographic entry see Field 02A.
W71-12351

CHAPTER 6. THE EFFECTS OF POLLUTION UPON AQUATIC LIFE,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 02A.
W71-12353

PROTECTING THE BIOSPHERE FROM TOXIC CHEMICALS,
Ministerstvo Zdravookhraneniya, USSR, Leningrad. Inst. of Biophysics.
For primary bibliographic entry see Field 06G.
W71-12471

THE BIOSPHERE AND MAN,
Ministerstvo Zdravookhraneniya, USSR, Moscow. Inst. of Biomedical Problems.
For primary bibliographic entry see Field 06G.
W71-12472

SHORELINE ALGAE OF WESTERN LAKE ERIE,
For primary bibliographic entry see Field 02H.
W71-12489

THE TRANSFORMATION OF ENERGY BY A STREAM DETRITIVORE, PTERONARCYS SCOTTI (PLECOPTERA),
Bucknell Univ., Lewisburg, Pa. Dept. of Biology.
Wayne F. McDiffett.
Ecology. 51 (6): 975-988. Illus, 1971.

Descriptors: *Energy budget, *Stoneflies, *Aquatic insects, Detritus, *Stream fisheries.
Identifiers: *Bioenergetics, Detritivore, Energy, Leaf, Plecoptera, Pteronarcys-Scotti.

The bioenergetics of a detritus-feeding stonefly P. scotti, were investigated. The nymphs were collected from a north Georgia trout stream and held under simulated field conditions of temperature and photoperiod in a laboratory stream. Rates of respiration and egestion were measured at temperatures approximating those in the field at the time of collection. An estimate of the growth rate of nymphs was made from a statistical analysis of monthly field samples. Calorimetric determinations were made of nymphs, molted exoskeletons, and feces. A 17-mo. energy budget for the average nymph was tabulated on the basis of the data collected. Assimilation and growth efficiencies were found to be low with mean values of 10.6%, 34.2%, and 3.6% for assimilation and net and gross growth efficiencies, respectively. An assessment was made of the rate of leaf breakdown by the nymphs, and a value of approximately 29.1% of the dry body weight per day was calculated. The functional importance of the organism to the stream community is discussed.—Copyright 1971, Biological Abstracts, Inc.
W71-12493

HYDROBIOLOGICAL AND ICHTHYOLOGICAL RESEARCHES ON THE VILSAN RIVER, AN AFFLUENT OF THE ARGES (IN RUMANIAN),
Societatea de Stiinte Naturale si Geografie din R.S.R., Bucharest.
Nicolae Stoica.
Comun Zool. 5: 105-114. Illus, 1967 (Russ and Engl summ).

Descriptors: *Rivers, *Aquatic biology, *Fishes, *Aquatic plants.
Identifiers: Arges River, Barbus-Meridionalis-Petenyi, Romania, Salmo-Trutta-Fario, Vilsan River.

Topography, flora and fauna of the Vilsan River are described. Of economic importance in the area is the presence of Salmo trutta fario and Barbus meridionalis petenyi. Primary production and trophic level relationships of the aquatic biota are discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12501

ON THE MICROFLORA ASSOCIATED WITH PORIFERA IN LAKE FARO (IN ITALIAN),
Messina Univ. (Italy). Istituto di Idrobiologia.
Vivia Bruni.
Atti Soc Peloritana Sci Fis Mat Natur. 14 (3/4): 165-170, 1968 (Engl summ).

Descriptors: *Microorganisms, *Lakes, *Coliforms, *E. coli, Water pollution effects.
Identifiers: Escherichia-Coli, Lake Faro, Hymeniacidon-Sanguinea, Italy, Porifera, Suberites-Curnosus.

Microflora were found inside 2 spp. of Porifera (Hymeniacidon sanguinea Grant and Suberites curnosus Johnston) from brackish Lake Faro which exhibited high amylolytic, proteolytic, ammonifying and sulfhydrogenic activity. Coliforms and Escherichia coli were also present in larger amounts. It is likely that in Suberites there was a higher bacterial content when compared with Hymeniacidon.--Copyright 1971, Biological Abstracts, Inc.
W71-12502

SOME LIMNOLOGICAL FEATURES OF LAKE LANGSJON, BJORKLINGE,
Uppsala Univ. (Sweden). Inst. of Physiological Botany.
Curt Forsberg, and Birgitta Forsberg.
Sv Bot Tidskr. 63 (1): 49-69. Illus, 1969.

Descriptors: *Lakes, *Eutrophication, *Vegetation.

Identifiers: Bjorklinge, Chara-lake, Lake Langsjon, Limnological, Sweden, Vegetation.

Results from sampling and literature data are summarized to give some ideas of the present conditions of Lake Langsjon. Langsjon is a ground water supplied hard water lake of Chara-lake character. The pH is about 8 and the water is clear with a high electrolytic content with an excess of Ca and sulfate compared with the standard composition. Vegetation and eutrophication mechanisms are given.--Copyright 1971, Biological Abstracts, Inc.
W71-12504

POLLUTION OF THE OCEAN WATERS OF ITALY: CAUSES, EFFECTS ON THE BIOLOGICAL ENVIRONMENT, CONTROL AND PREVENTION (IN ITALIAN),
Laboratorio Centrale di Idrobiologia, Rome (Italy).
Sergio Panella.
Boll Pesca Piscicolt Idrobiol. 23 (1): 55-87. Illus, Map, 1968 (Fr and Engl summ).

Descriptors: *Water pollution effects, *Water pollution sources, *Water pollution control, *Fisheries, *Environmental effects, Coasts, Sea water, Oceans.
Identifiers: Italy.

The development of anti-pollution programs for Italian coastal waters is proposed to save the fishing industry of the Mediterranean Sea and from further pollution of toxic substances.--Copyright 1971, Biological Abstracts, Inc.
W71-12506

PHYSIOLOGIC-ECOLOGICAL CHARACTERISTICS OF SOME DOMINANT POPULATIONS OF BACTERIA AND ACTINOMYCETES ISOLATED FROM BRACKISH WATERS OF THE DONJA NERETVA RIVER (IN SERBO-CROATIAN),
Sarajevo Univ. (Yugoslavia). Inst. of Biology.
For primary bibliographic entry see Field 05B.
W71-12507

BIOLOGY AND PRODUCTION OF EURYCERCUS LAMELLATUS (O. F. M.) IN THE LITTORAL ZONE OF LAKE NAROCH (IN RUSSIAN),
Belorussian State Univ., Minsk (USSR).
V. A. Babitskii.
Gidrobiol Zh. 6 (4): 37-43. Illus. 1970 (Engl summ).
Identifiers: Biology, Eurycercus-Lamellatus, Lake, Littoral, Naroch, Production, Zone.

The dynamics of quantity and fecundity of E. lamellatus were studied in the littoral zone of mesotrophic lake Naroch. The dependence of fecundity in Copepoda parthogenetic females on the dimensions of their bodies is different in different months. The volume of an egg in brood chambers of the females changes considerably during the season and is inversely dependent upon the water temperature. The quantity of E. lamellatus calculated by the graphic method of G. G. Vinberg amounted to 434.96 cal/sq. m which corresponds to 818.9 mg/sq. m of wet matter.--Copyright 1971, Biological Abstracts, Inc.
W71-12550

PLEISTOPHORA SP. (MICROSPORIDIA: NOSEMATIDAE); A NEW PARASITE OF SHRIMP,
Bureau of Commercial Fisheries, Galveston, Tex. Biological Lab.
For primary bibliographic entry see Field 02L.
W71-12551

IODINE METABOLISM IN CHILDREN AND WOMEN WITH ENDEMIC GOITRE IN CEYLON,
All-India Inst. of Medical Sciences, New Delhi.
M. G. Deo, and T. A. V. Subramanian.
Brit J Nutr. 25 (1): 97-105. Map. 1971.
Identifiers: Ceylon, Children, Deficiency, Endemic, Environmental, Goiter, Iodine, Metabolism, Women.

I metabolism was studied using labelled NaI in subjects with endemic goiter which is prevalent in the SW part of Ceylon, where the I content of the drinking water is low. The study was confined mostly to children of school age. The patients showed raised thyroidal uptake of 131I and 48 h serum protein-bound radioactive I, lowered plasma inorganic iodide and urinary iodide. The goiter which is endemic in Ceylon is probably due to environmental I deficiency rather than to a goitrogen.--Copyright 1971, Biological Abstracts, Inc
W71-12553

DIETARY SOURCES OF IODINE IN AREAS WITH AND WITHOUT IODINE-DEFICIENCY GOITER,
D. A. Koutras, P. D. Papapetrou, X. Yataganas, and B. Malamos.
Amer J Clin Nutr. 23 (7): 870-874. 1970.
Identifiers: Athens, Bread, Chicken, Cow, Deficiency, Dietary, Drinking, Goat, Goiter, Greece, Iodine, Iodization, Meat, Milk, Program, Sheep, Thessalia, Water.

A study is presented on the I content of drinking water, milk (from cows, goats and sheep) and various food items in the ready-to-eat form from Athens and from the endemic goiter areas of Thessalia, Greece. In general, the I content of Athens is lower than the values reported from the USA, and it is even lower in the endemic areas studied. There were no seasonal fluctuations of the I content of the water and the cow's milk. Milk from sheep contained more I during the late spring and the early summer. Substantial amounts of I were found consistently only in foods of animal origin. The great variation in the I content of chicken, meat and bread is attributed to the use of iodinated substances by some farms or bakeries. Even in the areas without endemic goiter, the I content of natural food is barely adequate; the universal iodization of household salt should ensure a sufficient intake in all member of the community, irrespective of their individual food habits.--Copyright 1971, Biological Abstracts, Inc.
W71-12554

EFFECT OF DIQUAT ON UPTAKE OF COPPER IN AQUATIC PLANTS,
Florida Univ., Fort Lauderdale. Dept. of Agronomy.
David L. Sutton, L. W. Weldon, and R. D. Blackburn.
Weed Science. 18 (6): 703-707. Illus. 1970.
Identifiers: Aquatic, Copper, Diquat, Egeria-Densa-M, Herbicide, Hydrilla-Verticillata-M, Naiad-M, Najas-Quadalupensis-M, Pentahydrate, Plants, Southern, Sulfate, Uptake.

Combinations of copper sulfate pentahydrate (CSP) at 1.0 ppmw (microgram/g dry plant weight) Cu plus 0.1 to 2.0 ppmw 6,7-dihydrodipyrido- (1,2-alpha:2'1'-c)pyrazinediium ion (diquat) resulted in higher accumulations of Cu in hydrilla (Hydrilla verticillata Casp.), egeria (Egeria densa Planch.), and southern naiad (Najas guadalupensis Spreng. Magnus) when compared to plants which received only CSP. A contact period greater than 24 hr was necessary before the higher amounts of Cu were detected in those plants treated with the combinations. Water samples from outdoor plastic pools 7 days after treatment with CSP at 1.0 ppmw of Cu plus 1.0 ppmw of diquat contained 25% less Cu than pools treated with CSP. Samples of hydrilla and southern naiad removed 7 days after treatment of the pools with the combination contained 77 and 38% more Cu, respectively, than samples from those pools treated with only CSP.--Copyright 1971, Biological Abstracts, Inc.
W71-12555

EFFECTS OF HERBICIDES ON WATER AND ITS INHABITANTS,
Dow Chemical Co., Midland, Mich.
W. R. Mullison.
Weed Science. 18 (6): 738-750. 1970.
Identifiers: Control, Fish, Herbicides, Inhabitants, Toxicity, Water, Weed.

Fish tolerance to weed killers varies with their size and species as well as with differences in the aquatic site. There may be variation to different forms of the active ingredient. Other components in a formulation may be more toxic than the herbicide itself. Therefore, the LD50 of different formulations should be determined. In addition, the manner and other circumstances involving application of a herbicide may change its toxicity to water inhabitants.--Copyright 1971, Biological Abstracts, Inc.
W71-12556

THE INFLUENCE OF DUTCH ELM DISEASE AND PLANT WATER STRESS ON THE FOLIAR NUTRIENT CONTENT OF AMERICAN AND SIBERIAN ELM,
Agricultural Research Service, Delaware, Ohio. Crop Resources Div.
For primary bibliographic entry see Field 02I.
W71-12557

VIBRIO PARAHAEMOLYTICUS STUDIES: (VIII) ON THE 'SPECIFIC' VIBRIO PARAHAEMOLYTICUS EXISTING FOR A LONG PERIOD OF TIME IN CITY RIVER-WATER, (IN JAPANESE),
Nagasaki Prefectlare Inst. of Public Health (Japan).
Norio Yasunaga.
J Food Hyg Soc Jap. 11 (1): 28-32. 1970 (Engl summ).
Identifiers: City, Existing, Japan, Long, Nagasaki, Period, River, Time, Vibrio-Parahaemolyticus, Water.

Water samples were collected at night from a river in Nagasaki. For plating after enrichment cultivation of river wate, TCBS-agar medium was employed. Results (given in tables) suggest that there may be an essential difference in susceptibility to lysis in river-water in the bacterial before and after isolation, and lead to the assumption that 'specific' V. parahaemolyticus of considerably prolonged survival may be present in natural river-water. The isolation of the organisms was inhibited on BS-broth. This action appears to be associated with the survival mechanism. No organism was detected in river water filtered through Millipore filters. There is no apparent explanation for the occurrence of 'specific' V. parahaemolyticus in city river-water at present; the organisms might exist in non-halophilic form in natural river-water before isolation.--Copyright 1971, Biological Abstracts, Inc.
W71-12564

HYGIENIC CHEMICAL STUDIES ON EFFLUENT WATER: VI. FUNDAMENTAL STUDIES ON HYGIENIC CHEMISTRY OF BRACKISH LAKE, (IN JAPANESE),
Ibaraki Prefecture Inst. of Public Health, Mito, (Japan).
Yasuyoshi Sayato.
J Hyg Chem. 16 (1): 32-38. Illus. 1970. (Engl. summ.).
Identifiers: Biological, Brackish, Chemical, Chemistry, Domestic, Effluent, Fundamental, Hygienic, Industrial, Lake, Oxygen, Sampling, Stations, Waste, Water.

The water quality of a brackish lake (the Kasumigaura) was investigated at the freshwater areas in which rivers polluted by industrial waste and domestic sewage flowed. Sampling stations were set up on each of the 6 rivers and at 8 points on the lake. Water quality of rivers flowing through cities and towns was influenced by the amount of rainfall on the sampling day. BOD (biological oxygen de-

mand) loading of the river polluted by industrial waste and domestic sewage increased in summer. The contamination of lake water near the shore depended on the flow of polluted river water; polluting substances were spread by waves.--Copyright 1971, Biological Abstracts, Inc.
W71-12568

HYGIENIC ASSESSMENT OF AMYL, PRIMARY, AND SECONDARY OCTYL ALCOHOLS FOR STANDARDIZING THEIR CONTENT IN WATER BODIES,
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
A. A. Korolev, G. N. Krasovskii, and S. P. Varshavskaya.
Gig Sanit. 35 (9): 88-89. 1970.
Identifiers: Alcohols, Allowabel, Amyl, Assessment, Bodies, Concentration, Guinea-Pig, Hygienic, Maximum, Mouse, Octyl, Organoleptics, Primary, Rabbit, Rat, Secondary, Standardizing, Water.

Recommended maximum allowable concentrations in natural water are 0.05 mg/l for primary and secondary octyl alcohols, and 1.3 mg/l for amyl alcohol. Values are based on toxicologic studies with mice, rats, guinea pigs, and rabbits. Organoleptic indications show these substances are sufficiently below recommended levels.--Copyright 1971, Biological Abstracts, Inc.
W71-12569

HEALTH ASPECTS OF THE ENVIRONMENT,
Gezondheidsorgasatie, TNO, The Hague (Netherlands).
J. W. Tesch.
Landbouwk Tijdschr. 82 (5): 189-193. 1970.
Identifiers: Environment, Environmental, Health, Human, Noise, Pollution.

The destructive effects of man's technological progress, such as noise and environmental pollution, are discussed with particular reference to the Netherlands. A cooperative solution by all nations is necessary.--Copyright 1971, Biological Abstracts, Inc.
W71-12570

MOLLUSKS AND BENTHIC ENVIRONMENTS IN HILLSBOROUGH BAY, FLORIDA,
Bureau of Commercial Fisheries, St. Petersburg Beach, Fla. Biological Lab.
For primary bibliographic entry see Field 02L.
W71-12600

MERCURY IN THE ENVIRONMENT,
Committee for Environmental Information, St. Louis, Mo.
For primary bibliographic entry see Field 05B.
W71-12603

RADIOACTIVITY OF THREE FRESH-WATER MOLLUSCS OF THE TIDAL COLUMBIA RIVER AND THEIR ASSOCIATED SEDIMENTS,
Geological Survey, Arlington, Va.
R. L. Cory, W. O. Forster, W. C. Renfro, and J. W. Nauman.
In: Hydrobiology, 'Bioresources of Shallow Water Environments', Proceedings of Symposium, Miami Beach, Florida, June 24-27, 1970; American Water Resources Association, Urbana, Illinois, Proceedings Series No. 8, p 162-173, 1970. 5 fig, 2 tab, 15 ref.

Descriptors: *Water pollution effects, *Radioactive wastes, *Mollusks, *Sediments, *Columbia River, Tidal waters, Analytical techniques, Trace elements, Nuclear powerplants, Nuclear reactors.
Identifiers: *Radionuclides.

The levels of radioactivity in three species of freshwater molluscs, the levels of activity of the sediments in which they live, and relationships between sediment characteristics and the species distribution are determined. Of the three molluscs studied, two, Anodonta oregonensis and Anodonta wahlamatensis, are members of the fresh-water mussel family, Unionidae. The third, Corbicula fluminea, an Asian clam, is a member of the family Corbiculidae. The principal source of the radionuclides is the Hanford reactors located approximately 350 miles upriver from Astoria, Oregon. The Columbia River water, used to cool the reactors, is subjected to intense neutron flux which induces radioactivity in many trace elements in the water. Although there is a wide spectrum of radionuclides present, including those from fallout, zinc-65 and chromium-51 are most common. Results of this study indicate Anodonta prefer sediment with a higher mud content than that preferred by Corbicula. (See also W71-12029 thru W71-12035) (Woodard-USGS)
W71-12663

A MICROBIOLOGICAL AND CHEMICAL INVESTIGATION OF EFFECTS OF MULTIPLE USE ON WATER QUALITY OF HIGH MOUNTAIN WATERSHEDS,
Montana State Univ., Bozeman. Joint Water Resources Research Center.
William G. Walter, Gary K. Bissonnette, and David G. Stuart.
Montana University Joint Water Resources Research Center, Bozeman, Report 17, June 1971. 130 p, 18 fig, 62 tab, 40 ref, append. OWRR Project A-027 MONT (1).

Descriptors: Microbiology, *Water quality, *Watersheds (Divides), *Mountains, *Pollutant identification, Montana, Water pollution effects, Water pollution sources, *Water utilization, *Coliforms, E. coli, *Enteric bacteria, Bacteria, Lumbering.
Identifiers: Hyalite watershed (Mont), Mystic watershed (Mont), *Serological studies, High mountain watersheds.

During the summers of 1969 and 1970 bacteriological determinations of coliform, enterococcal, and standard plate counts were performed on two high mountain drainage systems; Hyalite, a watershed open for public use and Mystic, a watershed that had been closed from 1917 until its opening for limited human activity in the spring of 1970. Serological studies on Escherichia coli isolates from water and wild animal (bear and elk) fecal droppings indicated the strong influence that wild game animals had on determining bacterial densities in the closed watershed. The opening of the closed watershed for limited public use and an extensive logging operation in 1970 coincided with decreasing bacterial densities in this drainage. (See also W71-12691) (Holje-Montana State)
W71-12690

MICROBIOLOGICAL STUDIES IN AN OPEN AND A CLOSED WATERSHED,
Montana State Univ., Bozeman. Joint Water Resources Research Center.
William G. Walter, and David G. Stuart.
Available from the National Technical Information Service as PB-202 852, $3.00 in paper copy, $0.95 in microfiche. Completion Report, July 1971. 14 p, 12 ref. OWRR Project A-027-MONT (2).

Descriptors: Water pollution sources, Microbiology, *Watersheds (Divides), *Water quality, Water pollution effects.
Identifiers: Watershed studies, High mountain watersheds.

Bacteriological determinations of coliform, enterococcal and standard plate counts were performed on two high mountain drainage systems; Hyalite, a watershed open for public use, and Mystic, a watershed that had been closed from 1917 until the spring of 1970. The cause of significant changes in the closed watershed is a direct result of the influences of its main tributary, the South Fork. Wild game animal populations which inhabitated the South Fork in 1969 were the primary cause of the high bacterial contamination. The opening of the closed watershed for limited public use and extensive logging operation in 1970 coincided with decreasing bacterial densities in this drainage. A more exhaustive analysis of this study, including the basic data, may be found in a thesis authored by G. K. Bissonnette. (See W71-12690) (Holje-Montana State)
W71-12691

A PRE-IMPOUNDMENT ECOLOGICAL STUDY OF THE BENTHIC FAUNA AND WATER QUALITY IN THE NORTH ANNA RIVER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
G. M. Simmons, Jr.
Available from the National Technical Information Service as PB-202 854, $3.00 in paper copy, $0.95 in microfiche. Virginia Water Resources Research Center, Blacksburg, Completion Report, Sept 1971. 9 p, 6 ref. OWRR A-031-VA (1).

Descriptors: *Benthic fauna, Acid streams, *Pre-impoundment, Background radiation, Water quality, Virginia, Thermal pollution, Cooling water, Water pollution effects, Mollusks.
Identifiers: Bacteriology, North Anna River (Va).

The North Anna River is a tributary of the Chesapeake Bay. The river rises in the upper Piedmont Province of Orange County, Virginia, and flows southeast for approximately 60 miles before joining the South Anna on the Coastal Plain to form the Pamunkey River. Virginia Electric and Power Company is building a 13,000 acre impoundment on the North Anna River to provide cooling water for a 14,000,000 kilowatt nuclear powered electrical generating facility. A detailed two-year water quality study has been made of the pre-impoundment basin. Results show that much of the pre-impoundment basin has been damaged by erosion, heavy metals, and acid drainage from old pyrite mine tailings on Contrary Creek. The river, below the confluence with Contrary Creek, is in the process of biological recovery, but the molluscan species have failed to become re-established within the pre-impoundment area. Increased discharge rates due to rainfall also produced high coliform counts. Construction of the impoundment is expected to ameliorate the effects of acid drainage and high coliform counts and hasten the recovery of the North Anna River below the dam site.
W71-12693

INCIDENCE OF PROSTHECATE BACTERIA IN A POLLUTED STREAM,
Michigan State Univ., East Lansing. Dept. of Microbiology and Public Health.
James T. Staley.
Available from the National Technical Information Service as PB-202 873, $3.00 in paper copy, $0.95 in microfiche. Completion Report, 1971. 18 p, 6 fig, 8 ref. OWRR A-027-MICH (2).

Descriptors: *Bacteria, *Sampling, *Bioassay, Water analysis, Coliforms, Analytical techniques, Microorganisms.
Identifiers: *Prosthecate bacteria, Caulobacter, Prosthecomicrobium, Hyphomicrobium, Ancalomicrobium.

The density of prosthecate bacteria was determined by direct and viable counting techniques in samples of water from polluted Red Cedar River, Michigan. These bacteria comprised from 0.62 to 1.1% of the total microflora. The caulobacteria were the predominant type, attaining the maximum density of 4000/ml. The other prosthecate forms, including Prosthecomicrobium, Hyphomicrobium, and Ancalomicrobium, were usually present at numbers less than 1/ml. No correlation between the frequency of prosthecate bacteria and that of coliforms was observed. (Wilde-Wisconsin)
W71-12698

THE BIOLOGICAL RESPONSE TO OIL IN THE MARINE ENVIRONMENT: A REVIEW,
Coast Guard, Washington, D.C. Oceanographic Unit.
Gary L. Hufford.
Available from the National Technical Information Service as AD-723 516, $3.00 in paper copy, $0.95 in microfiche. Coast Guard Research and Development Report, March 1971. 13 p, 23 ref.

Descriptors: *Oil wastes, *Water pollution sources, *Biological properties, *Water pollution effects, Aquatic animals, Environmental effects, Aquatic plants, Ecology, Oceans, Plankton.
Identifiers: *Marine biology, *Oil pollution.

It has been reported that from one to ten million metric tons of oil are injected into the ocean every year. A review of the literature indicates little is known about the short and long term fate and behavior of oil in the marine environment. Studies on the biological responses to oil have yielded ambiguous results. A recommended study to investigate biological responses to oil and its fractions in the marine environment is developed.
W71-12709

EVALUATING RISKS OF PESTICIDES TO FISH,
Water Pollution Research Labs., Stevenage (England).
John S. Alabaster.
Proceedings, Br. Insectic. Fungic. Conf., p 370-377, 1969. 8 p, 3 fig, 12 ref, Water Pollution Research Laboratory, Reprint No. 576.

Descriptors: *Fish toxins, *Fish, *Pesticides, Diquat, DDT, Toxicity, Biodegradation, *Toxins, Laboratory tests, Adsorption, Hydrolysis, Oxidation, Chemical precipitation, Aquatic environment, Aquatic weeds, Herbicides, Industrial wastes, Analytical techniques, Metabolism, Water pollution effects.
Identifiers: Median threshold concentration, Excretion.

Short term studies to determine the effect of pesticides and other toxins have too often ignored possible longer term effects and also the effects of other chemicals already present in the river as well as chemicals added with the toxin. A comprehensive testing survey using harlequins is outlined, with inclusion of long-term toxicity tests involving both low and high pesticide concentrations. Fish studies also are necessary to determine whether or not a particular toxin is concentrated in fish. If so, does the toxin decrease with time, biodegrade, volatilize, or does the fish remain tainted. These and other questions require careful attention from skilled personnel from Government agencies, river authorities, and Universities. Only by application of large quantities of specialized experts and innumerable tests can the true nature of long term effects of toxic chemicals on fish be clearly delineated. (Lowry-Texas)
W71-12735

WATER POLLUTION - 1970, PART 3.
United States Senate Committee on Public Works, Washington, D.C. Subcommittee on Air and Water Pollution.
For primary bibliographic entry see Field 05G.
W71-12767

WATER POLLUTION--1970 PART 4.
For primary bibliographic entry see Field 05G.
W71-12768

EFFECT OF MIXING ON OXYGEN UPTAKE RATE OF ESTUARINE BOTTOM DEPOSITS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-12835

OIL POLLUTION.
Environmental Protection Agency, Edison, N.J. Water Quality Lab.
For primary bibliographic entry see Field 05G.
W71-12836

PRIMARY PRODUCTION AND STANDING CROPS OF EPIPSAMMIC AND EPIPELIC ALGAE,
Bristol Univ. (England). Dept. of Botany.
M. Hickman, and F. E. Round.
British Phycological Journal, Vol 5 No 2, p 247-255, 1970. 4 fig, 6 tab, 14 ref.

Descriptors: *Primary productivity, *Standing crop, *Algae, Diatoms, Measurement, Detritus, Methodology, Sediments, Lakes, Chlorophyll, Hydrogen ion concentration, Carbon dioxide.
Identifiers: *Epipsammic algae, *Epipelic algae, Shear Water (England), Amphora ovalis, Opephora martyi, Cell counts, Navicula, Nitzschia, Stephanodiscus, Microcystis, Aphanizomenon, Anabena spiroides.

A method devised for determining primary production involved an additional step of removal of epipsammic algae from the sand grains. The epipelic algae were also separated from the sediment. Since the experiments were carried out in the laboratory and not in situ, primary production is designated 'potential' production. The 'potential' primary production of the epipelon and epipsammon of Shear Water (England) has been estimated and related to standing crop parameters over a thirty month period. All results are expressed per unit area of habitat to be comparable with results of other workers. The epipsammic algae comprise mainly small diatoms. The epipsammon can be separated from the epipelon and detritus by repeatedly swirling the sediment with lake water filtered through Whatman glass fibre filter paper removing phytoplanktonic primary producers and detrital material. Data have also been obtained for the 'potential production' of the flora in short cores from the same site. Standing crop and production of the epipsammon was always greater than that of the epipelon. Correlation between standing crop and production is closer for the epipelon than for the epipsammon owing to retention of dead cells in the latter community. (Jones-Wisconsin)
W71-12855

OXIDIZED MICROZONE AND THE CONSUMPTION OF OXYGEN IN THE MUD OF OLIGOTROPHIC PONDS (La microzone oxydee et la consommation d'oxygene dans les sediments des etangs oligotrophes),
Rennes Univ. (France). Faculte des Sciences; and Rennes Univ. (France). Hydrobiological Lab.
Georges Bertru.
Archiv fur Hydrobiologie, Vol 68, No 2, p 277-287, 2971. 2 fig, 3 tab, 21 ref. English summary.

Descriptors: *Oxidation, *Mud-water interfaces, *Boundary processes, Oligotrophy, Mathematical models, Oxygen, Sediments, Ferrous iron, Limiting factors, Oxygenation.
Identifiers: *Oxidized microzones.

The formation of an oxidized microzone was investigated in relation to time, partial pressure of oxygen, and the use of oxygen by sediments. At 9.2 mg/l of oxygen saturation, the maximum thickness of the microzone of 4 cm is reached in 10 days. The quantity of oxygen penetrating the water-mud interface in oligotrophic system depends on the biological demand, the partial pressure of oxygen, and the concentration of oxidizable elements in the water. In ponds maintaining the oxidized microzone throughout the year, it seems possible to determine the depth at which oxygenation no longer forms a barrier to ferrous iron and associated ions. (Wilde-Wisconsin)
W71-12856

LAKE EUTROPHICATION: A LABORATORY INVESTIGATION,
Ontario Water Resources Commission, Toronto. Div. of Research.
S. A. Black.
Ontario Water Resources Commission, Division of Research Paper No 2026, 1970. 26 p, 3 fig, 5 tab.

Descriptors: *Laboratory tests, *Eutrophication, *Nutrients, *Algae, Sewage, Productivity, Water pollution effects, Phosphorus, Nitrogen, Ammonia, Carbon, Chlorella.
Identifiers: *Limiting nutrients, Canada.

Water from an oligotrophic lake was seeded to native algae and placed into four 35-liter plexiglass containers. The cultures were fed with a mixture of lake water, distilled water, and variously treated sewage, and subsequently enriched in disodium phosphate and sodium carbonate hydrogen. Analyses of the media and algal counts indicated that 0.015 mg/l of P and 0.5 mg/l of N are required to produce growth response of algae in the lake investigated. Carbon below 8 mg/l inhibited the algal growth. Ammonia was used by Chlorella in preference to nitrates. Removal of phosphorus from sewage will greatly reduce the growth effect produced by conventionally treated activated sludge. (Wilde-Wisconsin)
W71-12857

GROWTH OF CHLORELLA IN RELATION TO BORON SUPPLY,
Argonne National Lab., Ill. Div. of Biological and Medical Research.
Landy McBride, William Chorney, and John Skok.
Botanical Gazette, Vol 132, No 1, p 10-13, 1971. 4 tab, 18 ref.

Descriptors: *Algae, *Chlorella, *Boron, Laboratory tests, Cytological studies, Plant growth, Scenedesmus.
Identifiers: Nostoc, Cylindrotheca.

The growth of Chlorella vulgaris, Columbia strain, either in low-boron or in purified media was not influenced by boron concentration within the range of 0.001 to 10.0 mg/l. No correlation was detected between the traces of boron in the algal cells and the concentration of the element in the nutrient solution. (Wilde-Wisconsin)
W71-12858

ULTRAVIOLET COMBUSTION OF DISSOLVED ORGANIC NITROGEN COMPOUNDS IN LAKE WATERS,
Michigan State Univ., Hickory Corners, W.K. Kellogg Biological Station.
For primary bibliographic entry see Field 05A.
W71-12860

NUTRITIONAL POLLUTION BEGS FOR A SOLUTION,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
George W. Reid.
Water and Wastes Engineering, p 48-49, and 52, June 1971. 1 fig, 3 tab, 5 ref.

Descriptors: *Mathematical models, *Eutrophication, *Sewage treatment, Nutrients, Phosphorus, Nitrogen, Detergents, Water pollution control, Biodegradation, Equations.
Identifiers: Algal growth potential, Prediction equation.

The suggested eutrophication model predicts the magnitude of the pollution problem and indicates avenues toward amelioration of conditions. The desired dilution of nitrogen and phosphorus concentrations is arrived at on the basis of the algal growth potential (AGP), density of pollution contributing population or its industrial equivalent, BOD, and the acceptable levels of nitrogen and phosphorus as determined by the AGP. The acceptable levels of the AGP are 10 mg/l for industri-

al and municipal waters, and 30-40 mg/l for recreational waters. These levels are valid for nitrogen/phosphorus ratio of 10:1 and carbon/nitrogen/phosphorus ratio of 50:10:1. (Wilde-Wisconsin)
W71-12862

ECOLOGY OF AQUATIC VASCULAR PLANTS IN SOUTHERN ONTARIO IMPOUNDMENTS,
Department of Lands and Forests, Maple (Ontario); and Ontario Water Resources Commission, Rexdale. Biology Branch.
A. M. McCombie, and Ivanka Wile.
Weed Science, Vol 29, No 3, p 225-228, 1971. 5 fig, 1 tab, 18 ref.

Descriptors: *Aquatic plants, *Impoundments, *Ecology, Ponds, Lakes, Soil types, Chara, Sago pondweed, Distribution, Dominant organisms, Plant growth, Depth, Flow, Shallow water, Ions, Hydrogen ion concentration, Dissolved oxygen, Alkalinity, Hardness (Water), Chemical analysis.
Identifiers: *Southern Ontario, Specific conductance, Transparency, Elodea canadensis, Potamogeton amplifolius, Potamogeton crispus, Potamogeton pectinatus, Potamogeton natans, Potamogeton foliosus, Potamogeton nodosus, Potamogeton interruptus, Potamogeton pusillus.

The design and management of small multipurpose impoundments were studied to determine the extent to which variations in species composition of plant communities are related to local environmental differences and establishment of certain macrophytic species as indicators of prevailing limnological conditions. Specific conductance is the most useful measurement of fertility since it reflects total ion concentration. Fertility of these waters, as indicated by specific conductance, appeared as a function of watershed area over the range 0 to 100 hectares. For watersheds greater than 100 hectares, differences in soil type and farming intensity were major causes of variability. Chara was most abundant between 218 and 300 micromhos/sq cm and grew best in upper end (2.4 to 5.8 m) of the transparency range. Eldea flourished at specific conductances of 224 to 300 micromhos/sq cm and at transparencies from 2.7 to 5.8 meters. Potamogeton amplifolius occurred only in least fertile impoundments and Potamogeton crispus only in most fertile. Potamogeton pectinatus occurred at specific conductances of 200 to 349 micromhos/sq cm, favoring extensive shallow areas subject to continuous summer flow. (Jones-Wisconsin)
W71-12864

ASSESSMENT OF POLLUTION EFFECTS BY THE USE OF ALGAE,
Liverpool Univ. (England). Hartley Botanical Labs.
Elsie M. Burrows.
Proceedings of the Royal Society of London, B, Vol 177, p 295-306, 1971. 5 fig, 22 ref.

Descriptors: *Algae, *Water pollution effects, *Indicators, *Sea water, Marine plants, Assessments, Monitoring, Sewage, Estuaries, Growth rates, Biological communities.
Identifiers: *Ulva, *Laminaria, Liverpool Bay (England), Irish Sea.

Increases in the diameter of thallus discs of Ulva and in the surface area of Laminaria algae served as the criterion for appraisal of sewage pollution. Relatively simple culture trials with samples of pure and polluted water from the Irish Sea disclosed that Ulva lactua and Laminaria saccharina have a high potential as indicators of pollution effects because of their ease of cultivation and sensitivity to changes in water composition, particularly those caused by sewage discharges. The behavior of different algae species with their alternation of generation offers wide possibilities for assessing both the eutrophying and toxic effects of urban and industrial pollution. (Wilde-Wisconsin)
W71-12867

STATISTICAL MODEL FOR THE SELECTION OF UNICELLULAR ALGAL STRAINS BY THE RATE OF INCREASE IN NUMBERS (Statisticheskaya model otbora shtammov odnokletochnykh vodoroslei po skorosti uvelicheniya chislennosti),
Agrofizicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 07B.
W71-12868

METHODS FOR DETERMINING THE PRIMARY PRODUCTIVITY OF EPIPELIC AND EPIPSAMMIC ALGAL ASSOCIATIONS,
Bristol Univ. (England). Dept. of Botany.
M. Hickman.
Limnology and Oceanography, Vol 14, No 6, p 936-941, 1969. 7 tab, 13 ref.

Descriptors: Primary productivity, *Biological communities, *Algae, *Methodology, Carbon radioisotopes, Diatoms, Measurement, Sediments, Sampling, Depth, Sea water, Fres water, Littoral, Dissolved oxygen, Diurnal, Migration patterns.
Identifiers: *Epipsammic algae, *Epipelic algae, Algal associations, Shear Water (England), Amphora ovalis, Opephora martyi, Abbot's Pond (Somerset, England), Sand grains, Tidal cycles.

Quantitative techniques of defined accuracy were developed for estimating primary productivity of both epipelic and epipsammic algal associations of both fresh and marine shallow and deep-water sites. For the epipsammic algal association samples were taken from a rich diatomal flora attached to sand grain surfaces in the littoral zone of a small lake. The algae were separated from the epipelic algae and detrital material and a C-14 source added. The algae were removed from the sand grains before assay for C-14 by sonification. The epipelic algal association was studied by trapping the algae with a double layer of lens tissue and C-14 method for assay. Harvesting time is critical, since epipelic populations show marked diurnal migration rhythms. After incubation, algae were removed from lens tissue. Since 87.5% of the epipelic population was trapped in the tissue and 85.8% of the trapped population removed from it, productivity estimates were attributable to 73.3% of total population. The primary productivity of both epipsammic and epipelic algae can also be studied with oxygen techniques. The routine methods for both associations, the epipelic and epipsammic, were statistically defined. (Jones-Wisconsin)
W71-12870

STANDING CROPS AND PRIMARY PRODUCTIVITY OF THE EPIPELON OF TWO SMALL PONDS IN NORTH SOMERSET, U K,
Bristol Univ. (England). Dept. of Botany.
M. Hickman.
Oecologia (Berl), Vol 6, p 238-253, 1971. 7 fig, 3 tab, 47 ref.

Descriptors: *Standing crop, *Primary productivity, Ponds, Productivity, Measurement, Nutrients, Methodology, Sampling, Shallow water, Diatoms, Chlorophyll, Sediments, Benthos, Phytoplankton, Cores, Carbon radioisotopes, Dissolved oxygen, Detritus.
Identifiers: *Epipelon algae, *Algal communities, Abbot's Pond (England), Priddy Pool (England), Equisetum fluviatile.

Benthic communities are important, particularly in shallow water, in food chains leading ultimately to fish production. Measurements of production of defined benthic communities are essential for understanding productivity of shallow bodies of water because wherever the substratum is in the photic zone benthic algae production will occur. The primary productivity and the standing crop of the epipelic algal communities in two small English ponds of contrasting nutrient status were measured over a two-year period, sampling at approximately two-weekly intervals. Chlorophyll a content of the epipelic algae was measured spectrophotometrically; primary productivity using the C-14 method. Standing crops reflected the richer nutrient status of eutrophic Abbot's Pond compared with the oligotrophic Priddy Pool as did the productivity results when the same depth category in both ponds was examined. Production resulted from an interrelationship among light intensity, standing crop size and other variable environmental factors in both pools. However, light in Abbot's Pond appeared to be the most important factor in limiting standing crop size and production in the deeper depth categories. The insignificance of all algal groups except diatoms is emphasized by good correspondence between chlorophyll a content and total diatom counts. (Jones-Wisconsin)
W71-12871

A POSSIBLE MECHANISM OF INSECTICIDE RESISTANCE IN MOSQUITOFISH,
Mississippi State Univ., State College. Dept. of Entomology.
D. L. Fabacher, and H. Chambers.
PHS Grant ES00412-01, Bulletin of Environmental Contamination and Toxicology, Vol 6, No 4, p 372-376, 1971. 2 tab, 10 ref.

Descriptors: *Water pollution effects, *Endrin, *Chlorinated hydrocarbon pesticides, *Pesticide kinetics, *Pesticide toxicity, *Fish physiology, Pesticides, Pesticide residues, Pesticide drift, Absorption, Path of pollutants, Resistance, Fishkill, Mortality, Water quality, Lethal limit, Environmental effects, Balance of nature, Chemcontrol.
Identifiers: *Mosquitofish, *Gambusia sp., Selection, Resistance mechanisms, Mechanisms of resistance.

Mosquitofish (Gambusia affinis) from a heavily insecticide contaminated site in Mississippi are resistant to most organochlorine pesticides. Similar resistance in the mosquito, Aedes aegypti, has been correlated with high fat content in larvae. This study compares the percent lipid content in insecticide-resistant and insecticide susceptible mosquitofish, and compares lipid content to survival of susceptible mosquitofish treated with endrin. The lipid content of resistant fish was 1.8 times that of susceptible fish. Susceptible fish that survived exposure to endrin consistently contained more lipid than did comparable dead fish. Resistant fish contained larger livers, partially due to higher liver fat content. Although the total mechanism of resistance is probably complex, organochlorine insecticides are highly lipophilic, and lipids could serve as a reservoir to protect the nervous system from the toxicant. (LeGore-Washington)
W71-12872

ACUTE TOXICITY OF AFLATOXINS B sub 1 AND G sub 1 IN THE RAINBOW TROUT (SALMO GAIRDNERI),
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
D. H. Bauer, D. J. Lee, and R. O. Sinnhuber.
PHS Grant No CA-06285, and ES-00256. Toxicology and Applied Pharmacology, Vol 15, p 415-419, 1969. 1 tab, 13 ref.

Descriptors: *Fish physiology, *Toxicity, Bioassay, Toxins, Poisons, Rainbow trout, Trout, Lethal limit, Mortality.
Identifiers: Aflatoxins, Mycotoxins, Aspergillus sp.

Nine-month old rainbow trout averaging 60 g each were used to determine the median lethal doses (LD50) of aflatoxins B sub 1 and G sub 1. The toxins were isolated from cultures of Aspergillus flavus (ATCC 15517) grown on rice. Statistical treatment of mortality occurring during the 10 day period after intraperitoneal injection of the mycotoxins gave LD 50 values of 0.81 mg/kg and 1.90 mg/kg for aflatoxin B sub 1 and G sub 1, respectively. Trout given oral doses of aflatoxins, or those given an LD 50 intraperitoneal dose, regurgitated their stomach contents. It is suggested that acute toxicity studies of aflatoxins given by the oral route in this manner are not practical in the case of the rainbow trout. (LeGore-Washington)
W71-12873

SOME RESEARCH NEEDS AND METHODS FOR PROTECTING NAIADS FROM EXTINCTION,
Federal Water Quality Administration, Duluth, Minn. National Water Quality Lab.
M. J. Imlay.
Annual Reports for 1969 of the American Malacological Union, p 49-51, 1969. 3 ref.

Descriptors: *Lethal limit, *Bioassay, *Mussels, *Oxygen requirements, *Copper, *Potassium, Dissolved oxygen, Resistance, Water pollution effects, Bioindicators, Metals, Physiological ecology, Environmental effects, Aquatic environment.
Identifiers: Naiads.

The water quality requirements of freshwater mussels were investigated. Riffle species require 2.5 ppm of oxygen over the 10-week period in the summer when oxygen is normally lowest. In the same period of time, 25 ppb of copper will kill them. Bioassay results led to the prediction that U.S. streams with more than 7.0 ppm of potassium would contain no mussels, those with 4.0 ppm or less of K would have mussels, and 4.0-7.0 ppm would indicate marginal quality. These observations were subsequently verified. (LeGore-Washington)
W71-12874

AN INEXPENSIVE METHOD FOR SIMULATING DIEL PATTERNS OF LIGHTING IN THE LABORATORY,
Federal Water Pollution Control Administration, Duluth, Minn. National Water Quality Lab.
R. A. Drummond, and W. F. Dawson.
Transactions of the American Fisheries Society, Vol 99, No 2, p 434-435, April 1970. 2 fig, 2 ref.

Descriptors: *Instrumentation, *Lighting, *Light intensity, Bioassay, Laboratory equipment, Facilities, Aquatic environment, Environmental effects.
Identifiers: Parameter control.

Bioassay results can be greatly influenced by a host of environmental factors. Intensity and duration of lighting is conceivably of importance. A system of lighting control is described that can be easily fabricated, costs less than $40, yet simulates sunrise and sunset at the beginning and at the end of the lighting period. The basic component is a time control unit which automatically turns fluorescent lights on and off at pre-determined intervals. The timing control operates in conjunction with a light dimmer control panel, which governs the intensity of light. (LeGore-Washington)
W71-12876

VISUAL OBSERVATION OF FISH BENEATH THE ICE IN A WINTERKILL LAKE,
Wisconsin Univ., Madison. Lab. of Limnology.
J. J. Magnuson, and D. J. Karlen.
Journal of the Fisheries Research Board of Canada, Vol 27, No 6, p 1059-1068, 1970. 4 fig, 2 tab, 7 ref.

Descriptors: *Fishkill, *Fish behavior, *Freezing, *Winterkilling, Water temperature, Anaerobic conditions, Morbidity, Mortality, Aquatic environment, Aquatic habitats, Cold resistance, Dissolved oxygen, Hydrogen sulfide, Yellow perch, Pikes, Sunfishes, Resistance.
Identifiers: *Survival mechanisms, Multiple parameters, Northern pike.

A device is described to directly observe fish behavior beneath the ice of a shallow lake. The viewing device, a 1.9 m tall plexiglass tube (14.0 cm inside diameter) sealed at the bottom, worked on the principle of a periscope. It was frozen into place in the center of a net enclosure. A man in a darkened hut lowered a mirror into the tube to observe the fish in the enclosure. Vertical distributions and behavior of 5 adult northern pike (Esox lucius), 6 yellow perch (Perca flavescens), and 13 bluegill (Lepomis macrochirus) were compared with the levels of dissolved oxygen, free carbon dioxide, hydrogen sulfide, and water temperature. Observations were made in Mystery Lake, Wisconsin during a period of winterkill. Yellow perch were the most active, northern pike the least. Bluegill remained farther beneath the ice than did the other two species. Northern pike took up residence in domes that they formed in the undersurface of the ice. Northern pike and yellow perch frequently sounded into the anoxic layers. Differences in fish behavior were significant in prolonging survival. A combination of little locomotive activity and a position immediately beneath the ice apparently favored the longer survival of northern pike over bluegill and yellow perch. (LeGore-Washington)
W71-12877

PRELIMINARY OBSERVATIONS ON THE EFFECTS OF SALINITY AND TEMPERATURE CHANGES ON MUGIL CAPITO FRY,
Ministry of Agriculture, Accre (Israel). Extension Service.
D. Mires.
BAMIDGEH, Bulletin for fish Culture in Israel, Vol 22, No 1, p 19-24, 1970. 2 fig, 4 tab.

Descriptors: *Salinity, *Mortality, *Aquiculture, *Water temperature, *Thermal stress, *Fish stocking, *Mullets, Morbidity, Lethal limit, Bioassay, Fish farming, Fish handling facilities, Fish management, Fishkill, Resistance, Fry.
Identifiers: *Mugil sp.

Wild-caught mullet fry experience considerable mortality when transferred to rearing ponds in Israeli aquicultural operations. This study was designed to determine the cause of death. Direct changes from seawater to tapwater, and vice-versa, of the same temperature caused no observable distress. Sudden salinity changes, therefore, do not seem to be the cause of mortality. Several fish were subjected to cooler temperatures; they became immediately distressed and several mortalities occurred. All tests were executed under field conditions so the changes in temperature were not particularly regular or at a planned rate. In spite of this, it seems quite clear that the mullet fry suffer very much from sudden changes in temperature. (LeGore-Washington)
W71-12878

REACTION OF MARINE FISHES AROUND WARMWATER DISCHARGE FROM AN ATOMIC STEAM-GENERATING PLANT,
Humboldt State Coll. Arcata, Calif. Div. of Natural Resources.
G. H. Allen, L. B. Boydstun, and F. G. Garcia.
The Progressive Fish Culturist, Vol 32, No 1, p 9-16, January 1970. 2 fig, 4 tab, 5 ref.

Descriptors: *Thermal stress, *Thermal pollution, *Water pollution effects, *Thermal powerplants, *Resistance, *Fish behavior, Hydroelectric plants, Nuclear powerplants, Thermal power, Heated water, On-site investigations, Marine fish, Fish attractants, Fish populations, Perches, Pile perch, Sculpins, White seaperch, Smelts.
Identifiers: Fish distribution, Surfperch, Greenling, Cabezon, Sand sole, Tomcod, Flounder, Rockfish, Smoothhound.

There is a paucity of observations on the behavioral response of fish to thermal effluents. The results are recorded of a hook and line sampling survey carried out in Humboldt Bay, California, near the site of a heated water outfall. In seven days of fishing, 731 fish, comprising 18 species, were taken. Indications of preference for warmer water were found in three species: walleye surfperch, pile perch and jacksmelt. Three species (striped seaperch, silver surfperch and white seaperch) exhibited some attraction to the outfall. Difficulty in characterizing the temperature distribution throughout the water mass fished might permit inference of limitations to the study's validity. (LeGore-Washington)
W71-12880

A SIMPLIFIED WATER SAMPLER,
Corps of Engineers, Jacksonville, Fla.
H. T. Holland.
The Progressive Fish Culturist, Vol 32, No 1, p 50, January 1970. 1 fig.

Descriptors: *Sampling, *Hydrologic data, Instrumentation, *Water analysis, Water chemistry, Water properties, Water quality, Chemical analysis.
Identifiers: *Water sampling.

A small, lightweight water sampler, useful around dense vegetation and brush, can be constructed for less than $5.00. The sampler is made of a double-action rubber bulb (presumably containing some type of check valve) and two lengths of rubber tubing. In operation, the discharge tube is placed in a sample bottle, and the intake tube opening is held at the depth to be sampled. Water is collected by squeezing the bulb, flushing and filling the sample bottle. (LeGore-Washington)
W71-12881

A SYSTEM FOR MAINTAINING CONSTANT DISSOLVED OXYGEN CONCENTRATIONS IN FLOWING-WATER EXPERIMENTS,
Humboldt State Coll. Arcata, Calif.
D. B. Hicks, and J. W. DeWitt.
The Progressive Fish Culturist, Vol 32, No 1, p 55-57, January 1970. 1 fig.

Descriptors: *Dissolved oxygen, *Bioassay, *Laboratory equipment, *Oxygenation, *Aeration, Laboratory tests, Treatment, Water quality, Water pollution effects, Facilities.
Identifiers: Constant-flow bioassay, Constant level control.

Maintenance of a constant dissolved oxygen concentration in a flowing-water experiment is difficult and requires specially designed equipment. A simple, inexpensive apparatus is described. The system delivers 6 separate streams of water of different and constant dissolved oxygen concentrations. Incoming water is first uniformly 'degassed' by bubbling nitrogen gas. The water is then delivered, via a centrifugal pump, to a closed vertical oxygenation column through which oxygen gas is bubbled. Six adjustable intake tubes are in the oxygenation column, and the height in the column at which its intake opening is set determines the dissolved oxygen concentration of the water carried by each tube. In all trials, dissolved oxygen levels varied only within plus or minus 0.2 mg/l. (LeGore-Washington)
W71-12882

USING BAYTEX TO CONTROL CRAYFISH IN PONDS,
Kansas Forestry, Fish, and Game Commission, Pratt.
J. Ray, and V. Stevens.
The Progressive Fish Culturist, Vol 32, No 1, p 58-60, January 1970. 4 tab.

Descriptors: *Chemcontrol, *Pesticides, *Water pollution effects, *Crayfish, *Aquatic insects, *Insect control, Aquiculture, Catfishes, Channel catfish, Application methods, Resistance, Toxicity, Lethal limit, Dipetera, Pest control, Rates of application.
Identifiers: Baytex.

Large numbers of crayfish in channel catfish rearing ponds cause many problems for the aquiculturist. Baytex was tried as a chemical control for crayfish in segeral Kansas ponds. Used at 100 ppb or greater, Baytex is an immediately effective control agent. At less than 100 ppb, the effect is less pronounced and a complete kill may require as long as 96 hr. Aquatic diptera are effectively 'controlled' at 50 ppb or greater. At rates as high as 250 ppb for 96 hr, Baytex is not harmful to fish. In treated ponds, rotifers made up the bulk of the surviving plankton population. (LeGore-Washington)
W71-12883

ECOLOGICAL MANAGEMENT PROBLEMS CAUSED BY HEATED WASTE WATER DISCHARGE INTO THE AQUATIC ENVIRONMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
John Cairne, Jr.
Water Resour Bull. 6 (6): 868-878. Illus. 1970.
Identifiers: Aquatic, Discharge, Ecological, Environment, Heated, Management, Pollution, Thermal, Waste, Water.

Discharge of heated waste water may affect the entire aquatic ecosystem--the interrelated biological, chemical, physical system--and, if the temperature change is large, may destroy the capacity of the ecosystem to serve a variety of beneficial purposes. However, it is possible to discharge heated waste water in carefully controlled amounts without seriously degrading the aquatic ecosystem. There are 4 basic alternatives which are open with regard to the heated waste water problem which may be chosen singly or invarious combinations: Placing all heated waste water in streams, lakes, and oceans without regard to the effects. Thus considering the environmental damage as a necessary consequence of increased power demand. Using, but not abusing, existing ecosystems. This means regulating the heated waste water discharge to fit the receiving capacity of the ecosystem. Finding alternative ways to dissipate or beneficially use waste heat, and modifying ecosystems to fit the new temperature conditions.--Copyright 1971, Biological Abstracts, Inc.
W71-12914

BIOLOGY AND WATER POLLUTION CONTROL,
For primary bibliographic entry see Field 05G.
W71-12921

A WATERBORNE EPIDEMIC OF SALMONELLOSIS IN RIVERSIDE, CALIFORNIA, 1965. A COLLABORATIVE REPORT.

Amer J Epidemiol. 93 (1): 33-48, Illus, Maps, 1971.
Identifiers: California, Chlorination, Collaborative, Contamination, Enteritis, Epidemic, Gastro, Human, Riverside, Salmonella-Typhimurium, Salmonellosis, USA, Water, Water-Borne.

The clinical and epidemiologic aspects of an epidemic of acute gastroenteritis occurring in Riverside, California, 1965, are described. More than 16,000 cases occurred; at least 70 patients were hospitalized and 3 died. The causative agent was Salmonella typhimurium phage type 2, which contaminated the municipal water supply. Water was obtained from deep wells and the exact source of contamination was not determined. However, the outbreak was brought under control by recognition of contamination and chlorination of the supply of water.--Copyright 1971, Biological Abstracts, Inc.
W71-12934

EFFECTS OF SOME COMMON INSECTICIDES AND OTHER ENVIRONMENTAL FACTORS ON THE HEART BEAT OF CARIDINA PRISTIS,
Vidyalankara Univ. of Ceylon, Kelaniya. Dept. of Zoology.
H. H. Costa.
Hydrobiologia. 35 (3/4): 469-480. Illus. 1970.
Identifiers: Beat, BHC, Caridina-Pristis, DDT, Dieldrin, Environmental, Heart, Insecticides, pH.

Higher concentrations of DDT, such as 2.5 ppm or 0.62 ppm solutions, bring about an arrest of the heart of C. pristis in a very short time. Concentrations of 0.1 and 0.05 ppm decrease the heart rate with time. A 2.50 ppm concentration of dieldrin arrests the heart beat within 100 min, while dilute concentrations increase the rate of heart pulsation. BHC appears to be similar to DDT in its effects on the heart rate. Water of very low and very high pH decreases the rate of heart beat; high salinities increase the rate.--Copyright 1971, Biological Abstracts, Inc.
W71-12973

POTASSIUM, SODIUM, MAGNESIUM AND CALCIUM CONTENTS OF CHINOOK SALMON TISSUES DURING VARIOUS STAGES OF THE LIFE CYCLE,
Harvard Medical School, Boston, Mass.
P. J. Snodgrass, and J. E. Halver.
Comp Biochem Physiol. 38 (1 Part A): 99-119. Illus. 1971.
Identifiers: Calcium, Chinook, Cycle, Fresh, Life, Magnesium, Oncorhynchus-Tshawytscha, Potassium, Salmon, Sea, Sodium, Tissues, Water.

The K, Na, Mg and Ca contents of plasma, red cells, brain, heart, muscle, liver, kidney and gills were measured in Oncorhynchus tshawytscha during 4 stages of the life cycle: while juveniles in fresh water, after 2 wk in seawater, as mature adults in the ocean, and after 3-4 mo. of fasting at the spawning grounds. Although plasma cation concentrations changed with each alteration in ionic environment, a remarkable constancy of cellular cation composition is maintained except for the juveniles in seawater. The normal K/N ratio in the muscle of spawning salmon is inconsistent with the hypothesis that pathological hyperadrenocorticism occurs at this stage.--Copyright 1971, Biological Abstracts, Inc.
W71-12976

POLYNUCLEAR AROMATIC HYDROCARBONS IN THE WATER ENVIRONMENT,
Pittsburgh Univ., Pa. Graduate School of Public Health.
For primary bibliographic entry see Field 05B.
W71-12977

ADAPTATION OF THYROID FUNCTION TO IODINE INTAKE IN BUENOS AIRES,
Buenos Aires Univ. (Argentina).
Hector M. Forcher, Aldo E. Lanaro, Carlos L. Enriori, and Juan Reforzo-Membrives.
J Clin Endocrinol Metab. 32 (2): 254-259. 1971.
Identifiers: Adaptation, Argentina, Buenos-Aires, Endemic, Function, Goiter, Human, Intake, Iodine, Low, Thyroid.

The thyroidal 131I-uptake of inhabitants of Buenos Aires is higher than that obtained in areas where I provision is adequate. The conversion ratio and the thyroid clearance of I are also high. Urine I and I content of water are low, as compared with values obtained in areas where there is no endemic goiter. Young men born and raised in Buenos Aires city have a 2.35% incidence of goiter of degree I, according to the classification of WHO (World Health Organization). When thyroid enlargements intermediate between degree 0 and I were taken into account, a further 17.9% of thyroid enlargement was recorded. These data point to a low I intake in Buenos Aires, the magnitude of which parallels that of the metabolic and morphologic changes in the thyroid gland. These changes, in turn, suggest that some adaptive mechanisms have maintained normal hormonal secretion. The classification of goiter provided by WHO should be revised, since it does not record goiters of moderate although significant size.--Copyright 1971, Biological Abstracts, Inc.
W71-12978

IODINE AND THYROID DISEASE IN LATIN AMERICA,
Massachusetts Inst. of Tech, Cambridge.
John B. Stanbury, and John P. Kevany.
Environ Res. 3 (4): 353-363. Illus. 1970.
Identifiers: America, Disease, Endemic, Goiter, Human, Iodine, Iodization, Latin, Programs, Salt, Thyroid.

Endemic goiter is a major health problem of Latin America despite required iodization of salt for human consumption. In many instances legislation has not been fully implemented or has been entirely neglected. As a result, edemic goiter and its consequences, edemic cretinism and deaf mutism, continue in many communities. Salt iodization programs have not been fully implemented for a variety of reasons, including failure to appreciate the economic and social disadvantages of goiter, apathy on the part of officials charged with the responsibility, the slight economic disadvantage of adding iodine or iodate to salt prepared from human consumption, and the real difficulties of introducing iodized salt into areas that are remote and severely deprived economically. When prophylactic programs employing iodized salt are not possible, the population group may be injected with iodized poppyseed oil as an alternative preventive measure. Programs employing this method are effective, economically sound, and acceptably free of medical risk.--Copyright 1971, Biological Abstracts, Inc.
W71-12979

EVIDENCE OF REDUCED SUSCEPTIBILITY TO DDT IN CONTROLLING SIMULIUM DAMNOSUM (DIPTERA: SIMULIIDAE) ON THE RIVER NIGER,
Niger Dams Project, Kainji Dam (Nigeria).
J. F. Walsh.
Bull W H O. 43 (2): 316-318. 1970.
Identifiers: Africa, Controlling, DDT, Diptera, Larvicide, Niger, Reduced, River, Simuliidae, Simulium-Damnosum, Susceptibility.

Despite many years of larviciding against blackflies, very few cases of reduced susceptibility to insectic ides were reported. The only published cases noted are in Japan, Canada and the USA. So far no concrete evidence is forthcoming from Africa, though Busvine and Pal (1969) reported a suspicion of DDT resistance in southern Ghana. Resistance was fully established in Japan after 9 yr of control, but the breeding site was small and very isolated. Attempts to determine the susceptibility level of S. damnosum larvae to DDT failed as it was not possible to keep the controls alive for 24 hr. Since Aug. 1968 the main Niger River breeding sites have disappeared under the waters of the newly formed Kainji Lake and control below the dam site is now carried out by fluctuating the spillway discharge levels. Insecticidal control, however, continues on several tributary rivers in the vicinity.--Copyright 1971, Biological Abstracts, Inc.
W71-12993

RESIDUAL ANOPHELISM IN THE PROVINCE OF GROSSETO, ITALY,
Instituto Superiore di Sanita, Rome (Italy). Laboratori di Parassitologa.
G. Majori, M. Maroli, S. Bettini, and E. G. Peirdominici.
Riv Parassitol. 31 (2): 147-154. 1970. (Engl. summ.).

Descriptors:
Identifiers: Anopheles-Algeriensis, Anopheles-Claviger, Anopheles-Labranchiae, Anopheles-Maculipennis, Anopheles-Maculipennis-Melanoon, Anopheles-Maculipennis-Messeae, Anopheles-Sacharovi, Anopheles, DDT, Grosetto, Italy, Larvicide, Malaria, Mineral, Oil, Province, Residual.

Causes which led (in 1966) to the interruption of indoor DDT applications against anopheline mosquitos, long after nalaria transmission has ceased, are reviewed. Satisfactory results obtained through larval control with mineral oil, applied since then, are also reported. During the control campaign of 1969, a survey on the residual anopheline mosquitoes was carried out in the coastal territories of the Province, where in previous years the malaria vectors were present. Species found were: Anopheles claviger, A. algeriensis, A. maculipennis s. l. A. m. melanoon and A. m. messeae were identified through ovipositions. The fact that A. labranchiae and A sacharovi were not

found in their characteristic breeding places indicates that species' densities are greatly decreased or that they have been eradicated from the Province. The recent increase of A. m. melanoon density in rice fields on the coast is discussed. Periodic surveys of anopheline density and larval control with mineral oil are necessary measures which give satisfactory results.--Copyright 1971, Biological Abstracts, Inc.
W71-12994

THE EFFECT OF FREE CHLORINE OF THE ORGANISM IN DRINKING WATER,
Institute of General and Municipal Hygiene, Moscow (USSR).
M. A. Gubar', T. P. Bogdanova, A. T. Voronov, and T. P. Butuchenkova.
Gig Sanit. 35 (8): 18-22. Illus. 1970. (Engl. summ.).
Identifiers: Chlorine, Drinking, Organism, Rat, Water.

Investigations were made on the capacity of the oral mucous membrane and that of the gastric juice of man to adsorb active Cl from water and the resistance of the mucous membrane to its irritating action. The irritating effect of active Cl on the upper sections of the digestive tract during long-term use of chlorinated water was studied in a test carried out on albino rats. The residual Cl concentrations in water within the level of 2.5 mg/l were practically innocuous.--Copyright 1971, Biological Abstracts, Inc.
W71-13004

THE LIFE CYCLE OF ACROSIPHONIA GRANDIS (ACROSIPHONIALES, CHLOROPHYTA),
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 02I.
W71-13014

DINEMA AMOEBOIDALE SP. N., DINEMA VIOLENTUM SP. N. AND DINEMA DISPICATUM SP. N. (EUGLENOIDINA). PARASITES OF COPEPODA IN LAKES IN THE ENVIRONMENT OF VILNIUS (LITHUANIAN SSR),
Polish Academy of Sciences, Warsaw. Inst. of Parasitology.
For primary bibliographic entry see Field 02H.
W71-13015

ENVIRONMENTAL EFFECTS OF MOLYBDENUM ON CARIES,
Bristol Univ. (England). School of Dentistry.
M. E. J. Curzon, J. Kubota, and B. G. Bibby.
Dent Res. 50 (1): 74-77. 1971.
Identifiers: Caries, Child, Environmental, Molybdenum.

Examination of 786 children in California towns situated on soils with high and low Mo contents failed to show differences in caries prevalence.--Copyright 1971, Biological Abstracts, Inc.
W71-13021

ON POIKILOSMOSIS AND ISO-OSMOSIS,
Erlangen-Nuremberg Univ. (West Germany). Zoologisches Institut.
For primary bibliographic entry see Field 02I.
W71-13022

SOME PROBLEMS OF THE ECOLOGY OF BENTHIC NEMATODES (NEMATODA) OF MIKOLAJSKIE LAKE,
Polish Academy of Sciences, Warsaw. Inst. of Zoology.
Prejs Krystyna.
Ekol Pol Ser A. 18 (9): 225-242. Illus. 1970. (Pol. summ.).
Identifiers: Algae, Benthic, Dependence, Ecology, Lake, Mikolajskie, Nematoda, Nematodes, Poland, Trophic.

Species composition and structure of dominance of benthic nematodes groupings in the littoral is more differentiated than in the profundal zone. A gradual decrease of the numbers of nematodes was observed together with the increase of depth. Three trophic groups of nematodes were distinguished: herbivorous, predators and detritus-feeders. A dependence was found between the abundance of herbivorous forms and the quantities of algae in the surface layers of bottom sediments in the littoral zone.--Copyright 1971, Biological Abstracts, Inc.
W71-13023

THE ECOLOGY OF A SMALL FORESTED WATERSHED TREATED WITH INSECTICIDE MALATHION-S35,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
Robert H. Giles, Jr.
Wildl Monogr. 24. 5-81. Illus. Map. 1970.
Identifiers: Amphibians, Bacteria, Chipmunks, Crayfish, Earthworm, Ecology, Fish, Forested, Fungi, Insecticide, Insects, Malathion, Mammals, Plants, Reptiles, Shrews, Snails, Sulfur-35, Treated, Watershed.

The faunal ecology of 2, deciduous-forested, 8-ha watersheds near Dover, Ohio, was studied intensively for 1 yr. The 2nd year, one of the watersheds was aerially sprayed with 0.81 kg/ha of malathion labeled with S-35. Effects of the insecticide were studied by sampling all faunal segments from the microbiota of the soil to vertebrates. The insecticide and its metabolites were followed from the airplane through the air, the forest vegetation, and in soil and water. No effects from the insecticide were observed on bacteria or fungi. Soil microarthropods were affected for a short time. Earthworms and snails were unaffected. Fishes and crayfishes, sensitive to malathion in tests, were unaffected in the stream environment. Insect numbers were greatly reduced, but recovered rapidly. Reptiles and amphibians were unaffected. Birds seemed to react to the insecticide for 2 days but no lasting effects were noted. Populations of mice and chipmunks appeared to be reduced by at least 30% on the treated area. Shrews and larger mammals apparently were unaffected. Sulfur 35 allowed critical movement and concentration studies on separate occasions of a 1-swath spray flight and of a total aerial treatment. Amounts of malathion and its metabolites in plants, animals, air, soil, and water were determined radiologically. Little insecticide was lost above the forest; major portions are intercepted within the vegetation. Malathion remained in the upper 15 cm of soil. Its presence in water was thought to be due to stream channel interception and to stream-side surface runoff. Malathion appears to be an effective insecticide that, although harmful to some forms, is of short residue and permits rapid recovery of decimated or altered populations.--Copyright 1971, Biological Abstracts, Inc.
W71-13031

PRIMARY PRODUCTION IN ALASKA TUNDRA LAKES,
Skidmore Coll., Saratoga Springs, N.Y.
For primary bibliographic entry see Field 02H.
W71-13032

PUGET SOUND FISHERIES AND OIL POLLUTION - a Status Report,
National Marine Fisheries Service, Seattle, Wash.
For primary bibliographic entry see Field 05G.
W71-13051

DEVELOPMENT OF TOXICITY TEST PROCEDURES FOR MARINE PHYTOPLANKTON,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Lab.
For primary bibliographic entry see Field 05G.
W71-13068

TOXICITY OF OIL DISPERSING AGENTS DETERMINED IN A CIRCULATING AQUARIUM SYSTEM,
Battelle Memorial Inst., Columbus, Ohio. William F. Clapp Labs.
For primary bibliographic entry see Field 05G.
W71-13070

SOME EFFECTS OF OIL POLLUTION IN MILFORD HAVEN, UNITED KINGDOM,
Field Studies Council, Pembroke (England). Oil Pollution Unit.
For primary bibliographic entry see Field 05G.
W71-13083

THE INFLUENCE OF OIL AND DETERGENTS ON RECOLONIZATION IN THE UPPER INTERTIDAL ZONE,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 05G.
W71-13084

CLEANING AND REHABILITATION OF OILED SEABIRDS,
Goteborg Univ. (Sweden).
For primary bibliographic entry see Field 05G.
W71-13086

EFFECTS OF EXPOSURE TO OIL ON MYTILUS CALIFORNIANUS FROM DIFFERENT LOCALITIES,
University of Southern California, Los Angeles. Allan Hancock Foundation; and Humboldt State Coll., Arcata, Calif. Dept. of Biology.
For primary bibliographic entry see Field 05G.
W71-13089

ASPECTS OF THE LIMNOLOGY OF FIVE SMALL RESERVOIRS IN NEW SOUTH WALES,
Monash Univ., Clayton (Australia). Dept. of Zoology.
B. V. Timms.
Proc Linn Soc N S W. 95 (1): 46-59. Illus. 1970.
Identifiers: Australia, Blooms, Cladocerans, Copepods, Entomostraca, Limnology, New-South-Wales, pH, Plankton, Reservoirs, Seasonal, Transparency, Zoo.

Three small reservoirs in the Maitland-Cessnock area and 2 in the adjacent Wyong area of New South Wales were studied for various periods up to 3 yr. One is deep (16 m), warm monomictic and oligotrophic, while the others are shallow (A 8 m) and, save one, eutrophic. The ones protected from wind stratify during summer, but the exposed ones only do so intermittently. The incidence of floods, rather than season, determines the pattern of transparency and pH changes. The limnetic zooplankton cycles are somewhat irregular, due mainly to the influence of floods and droughts. Blooms usually occur in spring and sometimes in autumn also. Most of the 17 cladocerans are aestival with spring and/or summer appearances while all 7 copepods are perennial. Almost all species are di-or polyacmic and multivoltine. An average of 9.0 entomostracan species occur in the limnetic region of each reservoir with 4.7 being present at any 1 time and only 2.2 causing blooms.--Copyright 1971, Biological Abstracts, Inc.
W71-13096

ALKALINE PHOSPHATASES AND PHOSPHORUS AVAILABILITY IN LAKE KINNERET,
Kinneret Limnology Lab., Tiberias (Israel).
T. Berman.
Limnol Oceanogr. 15 (5): 663-674. Illus. 1970.
Identifiers: Algal, Alkaline, Bloom, Fluctuations, Kinneret, Lake, Phosphatases, Phosphorus, Seasonal.

Alkaline phosphatase activities were determined in water samples taken from 3 depths at a central point in Lake Kinneret (Lake Tiberias). Seasonal fluctuations were shown, and also indications of induction-repression or activation and inhibition mechanisms, or both, with respect to total P, and, during stratification, the existence of a metalimnetic layer of intense activity. Phosphatase activities with 'natural' substrates and estimates of P availabilities were derived by measuring release of soluble inorganic orthophosphate from samples saturated with chloroform. P, which appeared to be adequate during the main (algal) bloom season, may have become limiting from the end of a summer until overturn. In epilimentic waters 30-66% of total P was hydrolyzed with a turnover time of 3-6 days.--Copyright 1971, Biological Abstracts, Inc.
W71-13097

INCORPORATION OF ORGANIC CARBON BY DAPHNIA PULEX
Manitoba Univ., Winnipeg. Dept. of Zoology.
R. K. Bell and F. J. Ward.
Limnol Oceanogr. 15 (5): 713-726. Illus. 1970.
Identifiers: Carbon, Daphnia-Pulex, Food, Organic, Phyto, Plankton, Temperature.

The rate of incorporation of organic carbon by D. pulex from various concentrations of 14C-labeled phytoplankton and artificial detritus was measured both in situ in West Blue Lake, Manitoba, and in the laboratory. Incorporation of artificial detritus was independent of dissolved O2 concentration, down to a level of 2.8 mg O2/liter, during a 4-hr experiment. Food concentration and temperature were related, for each food type, to incorporation in multiple regression equations. Three estimates, ranging from 2.37 to 5.35 microgram C/individual/day, were made of daily incorporation, assuming it was similar in natural and artifical detritus. Of these amounts, from 12 to 17% was estimated to be incorporated by Daphnia below 12m, in the zone where particulate organic matter was predominantly detritus or moribund organisms. Variations in incorporation rate were caused primarily by temperature differences encountered during vertical migration rather than by food concentration. Because vertical migration patterns varied, temperature regimes also varied, and so, consequently, did incorporation rates. The estimated contribution of detrital C to total daily incorporation was much less than the phytoplankton contribution but was significant.--Copyright 1971, Biological Abstracts, Inc.
W71-13100

5D. Waste Treatment Processes

OIL SPILL TREATMENT WITH COMPOSTED DOMESTIC REFUSE,
Westinghouse Research Labs., Philadelphia, Pa.
For primary bibliographic entry see Field 05G.
W71-13071

ELECTROCHEMICAL ACTIVATION AND REGENERATION OF CARBON SURFACES FOR TERTIARY WATER TREATMENT,
Virginia Polytechnic Institute and State Univ., Blacksburg. Dept. of Chemical Engineering.
G. B. Wills.
Available from the National Technical Information Service as PB-202 628, $3.00 in paper copy, $0.95 in microfiche. Virginia Water Resources Research Center, Blacksburg, Completion Report, August 1971. 9 p, 2 tab, 1 ref. OWRR A-032-VA (1).

Descriptors: *Activated carbon, *Tertiary treatment, *Waste water treatment, Oxidation, Dieldrin, Electrochemistry, Surfaces, Absorption.
Identifiers: *Electrochemical activation, Regeneration.

Electrochemical activation of wetted carbon surfaces was accomplished by anodic oxidation of 20% hydrochloric acid to evolve chlorine at the surface to be activated. Current densities in the range of 0 to 125 milliamps per square centimeter were employed and increases in apparent absorptivity as determined by polarization currents were as high as factors of 30 to 50. In pilot scale studies it was found that most of the absorptive capacity of the carbon surfaces was interior to the wetted surface and that the capacity of the activated surface was only about 10% greater than that of untreated surfaces for service in removing the persistent pesticide Dieldrin from otherwise potable water. Spent carbon surfaces were returned to their initial capacity following electro-activation.
W71-12324

ECONOMICS OF WASTEWATER TREATMENT,
Texas Univ., Austin. Dept. of Civil Engineering; and Engineering Science of Texas, Inc., Austin.
W. W. Eckenfelder, Jr., and D. L. Ford.
Chemical Engineering, Vol 76, No 18, p 109-118, 1969. 8 fig, 7 tab, 5 ref.

Descriptors: *Mathematical models, *Economics, *Waste water treatment, *Estimating, Capital costs, Operating costs, Water reuse, Sewage treatment, Industrial wastes, Activated sludge, Trickling filter, Tertiary treatment.
Identifiers: *Product recovery, *Recycling, Generalized cost model, Unit cost estimating model.

The economics of various wastewater treatment methods are compared and analyzed. The major economic considerations discussed are capital and operating costs of processes required to produce a defined quality of effluent; in-plant process and equipment modifications required to render a treatment process feasible or less costly; and returns to industry in terms of product recovery and water reuse. Included is a mathematical model for determination of the physical parameters of different treatment processes, and an optimization model for estimating treatment system costs given volume and organic influent and effluent requirements. (Wade-Wisconsin)
W71-12345

ENVIRONMENTAL FINANCING ACT OF 1971 (A BILL TO ESTABLISH AN ENVIRONMENTAL FINANCING AUTHORITY TO ASSIST IN THE FINANCING OF WASTE TREATMENT FACILITIES, AND FOR OTHER PURPOSES).
For primary bibliographic entry see Field 06E.
W71-12373

CENTRAL FRESNO COUNTY WATER AND LIQUID WASTE PROGRAM: VOLUME III. EXISTING WATER AND WASTE FACILITIES.
Grunwald, Crawford and Associates, Inc., Fresno, Calif.

Available as PB-197 504 from Nat. Tech. Service, Springfield, Va. 22151--Price $6.00 printed copy. Supported by US Dept of Housing and Urban Development. California, Fresno County Planning Department Report, July 1970. 370 p.

Descriptors: *Hydrologic data, *Data collections, *Water supply, *Surface waters, *Groundwater, *California, Groundwater basins, Water quality control, Aquifers, Streamflow, Hydrogeology, Safe yield, Water balance, Water quality, Geochemistry, Surface-groundwater relationships, Floods, Water distribution (Applied), Water management (Applied).
Identifiers: *Fresno (California).

The central Fresno County Water and Liquid Waste Program is presented in a series of five volumes. Detailed background information gathered and analyses were undertaken during the execution of the study. This section presents information on the quantity, quality, and various sources of natural water within the Fresno Groundwater Basin, California. Information is also presented on surface and subsurface geology, occurrence and flow of groundwater, groundwater reservoir capacity, groundwater reservoir replenishment, and the geochemistry of groundwater. For surface water supplies, hydrologic characteristics of the stream and river systems which occur within the Fresno Groundwater Basin are described. This includes information on the historical variations in flow rates, stream regulation, and flood characteristics. The disposition of flows in these watercourses for use within the Fresno Groundwater Basin is delineated. Information is also presented on the quality characteristics of both groundwater and surface water supplies in the Fresno Groundwater Basin. (Knapp-USGS)
W71-12374

THE DESIGN OF ARTIFICIAL RECHARGE SCHEMES,
Vattenbyggnadsbyran Ltd., Stockholm (Sweden).
G. Winqvist, and K. Mareliun.
Paper No 3 of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970: The Water Research Association, Marlow, England. 14 p, 6 fig.

Descriptors: *Artificial recharge, *Water treatment, *Pit recharge, Water quality, Aquifer characteristics, Hydrogeology, Water reuse, Industrial wastes, Water chemistry, Turbidity, Self-purification, Water temperature, Withdrawal.

Planning of equipment for artificial recharge includes selecting a series of plant components from the raw water intake to the treated water section. The factors which mean most for the design and localizing of the plants are the quality of the raw water and the geological conditions. Even climatic conditions exercise some influence on the design. The basic principle used in planning is that raw water shall be retained sufficiently long in the ground to be modified into groundwater. Quality of the raw water, particularly regarding such substances as occur in industrial pollution, and also the capacity of the ground to receive, transport and modify the infiltrated water must be considered. (Knapp-USGS)
W71-12406

WATER QUALITY ASPECTS OF INTERMITTENT SYSTEMS USING SECONDARY SEWAGE EFFLUENT,
Water Conservation Lab., Phoenix, Ariz.
H. Bouwer.
Paper No 8 of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970: The Water Research Association, Marlow, England. 19 p, 4 fig, 4 tab, 14 ref.

Descriptors: *Artificial recharge, *Reclaimed water, *Waste water treatment, *Water spreading, *Alluvial channels, Arizona, Filtration, Tertiary treatment, Nitrates, Phosphates, Hydrogeology, Water reuse, Water costs.

An experimental project on reclaiming water from secondary sewage effluent by groundwater recharge with infiltration basins in the dry Salt River bed near Phoenix, Arizona, shows that the infiltration rate in grass-covered basins is 25% higher, and in gravel-covered basins 50% lower, than in a bare soil basin. Alternating 2-week inundation periods with 10 day dry-up periods (17 days in winter) yields an annual infiltration rate of about 100 m (330 ft). The hydrogeological conditions of the Salt River bed, about 0.9 m (3 ft) of fine, loamy sand underlayed by sand and gravel layers to great depth and a groundwater table of about 3 m (10 ft) depth, are favorable for high-rate waste water reclaimation by groundwater recharge. Reclaimed water, pumped from 9 m (30 ft) depth in the center of the recharge area, has a biochemical oxygen demand of about 0.5 mg/liter (BOD of the sewage effluent is about 15 mg/liter) and a median fecal coliform density of 1 per 100 ml. Nitrogen, which is almost all in the ammonium form at a concentra-

tion of 25 ppm N in the sewage effluent, is essentially all converted to the nitrate form in the reclaimed water if sequences of short inundation periods (3 days or less) are held. Phosphate concentration in the reclaimed water pumped from 30 foot depth in the center of the recharge area are around 10 ppm P, as compared to 26 ppm in the effluent. To reclaim the sewage flow of 370 million cu m per year that is expected in the Phoenix area by the year 2000, about 370 ha (950 acres) of infiltation basins would be required. Cost of reclaiming water in this manner would be about $4 per 1000 cu m. (Knapp-USGS)
W71-12411

PHYSICAL ASPECTS OF ELECTROFILTRATION,
Jadavpur Univ., Calcutta (India). Dept. of Physical Chemistry.
S. P. Moulik.
Environmental Science and Technology, Vol 5, No 9, p 771-776, September 1971. 7 fig, 2 tab, 19 ref.

Descriptors: *Water purification, *Filtration, *Electrochemistry, *Water pollution treatment, Analytical techniques, Separation techniques, Sediments, Oily water, Algae.
Identifiers: *Electrofiltration.

The primary physical phenomena involved in electrofiltration and a theory for the process are discussed. Electrophoretic filtration was effective in suspension clarification, especially for water and waste purification. Systems such as bentonite clay suspensions, suspensions of pure culture of algae, oil-in-water emulsion, river water, etc. were chosen as representative models for commonly occurring polluted water samples. The electrofiltration process includes electrophoresis and filtration. The filter-cake buildup encountered in normal filtration can be completely avoided in this method. Considerations of filter medium electro-osmosis, filter-cake electro-osmosis, and particle electrophoresis have modified the filtration equation of Sperry to predict electrofiltration results. For efficient electrofiltration a critical voltage must be attained. This voltage completely prevents the filtration hindrance of a deposited filter-cake. (Woodard-USGS)
W71-12467

THE INFLUENCE OF TOXIC SUBSTANCES ON THE FUNCTIONING OF BIOLOGICAL PURIFICATION PLANTS,
Service pour le Controle du Pollution de l'Aire (Switzerland).
L. Thelin.
Z Praventivemed. 15 (3): 203-205. 1970. (Engl. and Ger. summ.).
Identifiers: Activated, Agricultural, Bacterial, Biological, Filter, Functioning, Industrial, Maintenance, Plants, Population, Purification, Sludge, Substances, Toxic, Waste, Water.

Procedures of biological purification-bacterial filters or activated sludge-make use of the action of a population of microorganisms to destroy foreign matters in used water. In order to maintain this population in an active condition and to obtain sufficient purification, rapid variations in the charge or discharge of used water should be avoided. The influx of toxic residual products should also be avoided. Examples of agricultural water: arrival of liquid manure, and industrial water: discharge of acid, cyanide or heavy metal are discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12571

EFFECT OF SOME FACTORS ON THE DEGREE OF PURIFICATION OF WOOL RINSING WASTES WHILE CULTIVATING ALGAE IN THEM, (IN UKRAINIAN),
Akadimiya Nauk URSR. Kiev. Inst. of Botany.
H. M. Palamar-Mordvyntseva, and V. V. Stupyna.
Ukr Bot Zh. 27 (2): 171-174. 1970. (Engl. summ.).
Identifiers: Acidification, Algae, Ankistrodesmus-Braunii, Cultivating, Degree, Dilution, Purification, Rinsing, Wastes, Wool.

The effect of varied amounts of Ankistrodesmus braunii, inoculated under laboratory conditions, on the degree of water purification of factory wastes and on dilution and acidification of sewage was studied. It was established that 1 ml inoculate/l of sewage is the most effective concentration. One milliliter of inoculate contains 1 million algal cells. The greatest purification of factory wastes was observed when the algae-waste mixture was diluted 1:1 by running water. Optimal purification is also reached in wastes acidified with HCl.--Copyright 1971, Biological Abstracts, Inc.
W71-12572

THE CHARACTER AND TREATABILITY OF LOG POND WATERS,
Public Health Service, Denver, Colo. Bureau of Water Hygiene.
Jack Hoffbuhr, Frank Schumburg, and Guy Blanton.
Water and Sewage Works, Vol 118, No 7, July 1971. p IW/3-IW/8, 2 fig, 3 tab, 13 ref.

Descriptors: *Lumbering, *Pulp and paper industry, *Industrial wastes, *Pulp wastes, Adsorption, Filtration, Coagulation, Biodegradation, Chemical oxygen demand, Biochemical oxygen demand, Nitrogen, Phosphorus, Oxygenation, Activated carbon, Waste water treatment.
Identifiers: Tannins, Alum, Suspended solids.

There are 12,000 acres of log storage ponds in Oregon alone. Water storage inhibits end splitting, surface cracking, fungal attack, and insect damage. However, one extensive study of over 80 such ponds in Oregon reported 200 to 700 mg/l COD and 200 to 800 mg/l total solids in the waters. 4 log ponds were then used to provide samples to test sand filtration, bench scale biological aerators, chemical coagulation, and carbon adsorption. Since the pollutants in the water were mainly leached from the bark and the wood of the trees, they were in the dissolved or colloidal form. Also, BOD to COD ratios were found to be very low, indicating a high percentage of non-biodegradable matter. Nitrogen and phosphorus were found to be present in sufficient quantities to allow aerobic biological treatment to effectively reduce the BOD. Sand filtration was ineffective, and although chemical coagulation with alum at 125 to 175 mg/l removed most of the suspended solids, over half of the BOD remained. Carbon adsorption was capable of 92% removals, but pilot scale tests were recommended to aid in final designs. (Lowry-Texas)
W71-12713

PHYSICAL STRUCTURE OF ACTIVATED SLUDGE IN AEROBIC STABILIZATION,
G. Laubenberger, and L. Hartmann.
Water Research, Vol 5, No 6, p 335-341, June 1971. 13 fig, 9 ref.

Descriptors: *Activated sludge, *Aerobic treatment, *Sludge digestion, Municipal wastes, Aeration, Flocculation, Particle size, Sieve analysis, Analytical techniques, Laboratory tests, Density, *Waste water treatment, *Sludge treatment.
Identifiers: Thomas a-value, Flocs, Organic sludge, Inorganic sludge.

The change in the physical parameters of activated sludge undergoing aerobic stabilization was monitored by observing floc size, specific weight, and the a-value (Thomas 1954). Particle size was measured using sieves of mesh sizes of 32, 50, 80, 100, 160 and 250 micro m. Specific weight was determined through use of a pycnometer, and the Thomas a-values (water-volume/sludge-solids-volume of floc) were calculated from the Thomas formulae. A stabilization time of ten days was used and both laboratory sludges and activated sludge from a municipal sewage plant were observed. Both the particle size and the a-values were observed to change as the organic content of the sludge decreased. Flocs formed of large particles or various size particles contained less stagnant water in the interstices than flocs formed of small particles. Also, the larger the particle size, the greater the effect of aerobic stabilization in reducing floc water content and increasing floc density. Although aerobic stabilization does lead to a denser floc with less water content, the differences in a-values of activated sludge flocs and inorganic chemical flocs are of the order of two magnitudes. (Lowry-Texas)
W71-12714

SETTLING CHARACTERISTICS OF SLUDGE SEDIMENTED FROM AN INDUSTRIAL EFFLUENT CONTAINING LEAD COMPOUNDS,
Salford Univ., (England). Dept. of Chemistry.
J. R. Christian, and D. Dollimore.
Water Research, Vol 5, No 5, p 177-181, May 1971.

Descriptors: *Sludge, *Stoke's Law, *Settling velocity, Sedimentation rates, Particle size, Dewatering, Bulk density, Oil, Laboratory tests, Analytical techniques, Detergents, Filtration, Effluents, Industrial wastes, Waste water treatment.
Identifiers: *Lead compounds, *Hindered settling techniques.

Sedimentation behaviour of an industrial effluent containing lead compounds was investigated. A series of tests was performed in which the sludge was diluted to different concentrations and allowed to settle. The sludge was determined, from physical and chemical analysis, to contain 87% water, while oil constituted only 0.8% of the dry weight of solids. The sludge was filtered and the residue dried, washed with distilled water, dried, and washed with carbon tetra chloride to remove the oil. The bulk density of dried solids increased from 1.47 before the oil removal to 1.61 after the oil removal, a significant increase. Addition of a commercial detergent also removed the oil and produced a reduction in settled volume. However, settling times for the sludge were greatly increased, and the supernatant carried a greater pollutional load, necessitating an economic evaluation to determine optimum conditions. A discussion of the hindered settling method for particle radius determination is presented. (Lowry-Texas)
W71-12716

SELECTION PATTERNS IN A DENITRIFYING POPULATION,
National Inst. for Water Research, Pretoria (South Africa).
T. R. Davies, P. J. DuToit, and D. F. Toerien.
Water Research, Vol 5, No 6, p 353-363, June 1971. 8 fig, 2 tab, 21 ref.

Descriptors: *Denitrification, *Bacteria, Metabolism, Enzymes, Fermentation, Analytical techniques, Laboratory tests, Centrifugation, Waste water treatment.
Identifiers: *Oxidative phosphorylation, *Substrate phosphorylation, Glucose, Malate, Citric acid cycle, Pentose phosphate shunt, Glycolysis, Cytochromes, Absorbance.

A laboratory scale batch reactor was seeded with denitrifying bacteria from both glucose and malate fed cultures. The reactor was then fed glucose solution for thirty hydraulic residence times (1 HRT—2 hours), after which the feed was gradually changed to malate. Denitrification proceeded on both substrates, but significantly more efficient denitrification was obtained using malate as carbon source. It was determined the glucose denitrification occurred via glycolysis, the pentose phosphate shunt and the citric acid cycle. Malate, however, was utilized mainly by the citric acid cycle. Metabolic characteristics fluctuated widely during the population selection process caused by the switch from glucose to malate. Oxidative phosphorylation, indicated by large concentrations of cytochromes, was predominant in the malate culture, while the glucose fed culture was subject to

considerable substrate phosphorylation. Much of the glucose was fermented to obtain energy, so when malate was introduced, the glucose fermenters were washed out. Oxidative phosphorylation bacteria then bacame the major part of the population, giving a high denitrification rate. (Lowry-Texas)
W71-12718

MINOR MODIFICATION OF THE BOD TEST,
W. N. Wells.
Water and Sewage Works, Vol 118, No 7, July 1971, p 207-209. 4 tab, 2 ref.

Descriptors: *Dissolved oxygen, *Biochemical oxygen demand, *Laboratory tests, Analytical techniques, Domestic wastes, Oxidation, Incubation, Temperature, Waste dilution, Saturation, Mixing, Reaeration, Waste water treatment.
Identifiers: *Iodine.

Several modifications of the Standard BOD test were suggested. The use of only those BOD bottles between 298 and 302 ml eliminated the need for measuring each quantity precisely before titration. Also, by blowing air through the dilution water, and shaking the actual sample quite vigorously, the diluted samples was assumed to be oxygen saturated. Two assumptions pertaining to this modification were: (1) there is no significant BOD change resulting from violent agitation of a waste over short periods of time, and (2) a sample of waste in a small flask at 20 deg C becomes saturated with oxygen when shaken and retains most of this oxygen for 10 to 15 minutes. Field tests on actual plant influent substantiated both assumptions. Procedures for determining the immediate dissolved oxygen demand are also presented, along with sample calculations for both BOD and IDOD. (Lowry-Texas)
W71-12719

SEWAGE FUNGUS: STUDIES OF SPHAEROTILUS SLIMES USING LABORATORY RECIRCULATING CHANNELS,
Water Pollution Research Lab. Stevenage (England).
E. J. C. Curtis, J. Delves-Broughton, and D. W. Harrington.
Water Research, 1971, Vol 5, p 267-279. 10 fig, 6 tab, 15 ref.

Descriptors: *Sphaerotilus, *Slimes, Laboratory tests, Sewage organisms, *Fungi, Microorganisms, Bacteria, Sampling, Phosphates, Dissolved oxygen, Nitrates, Temperature, Flow rate, Protozoa, Waste water treatment, Sewage treatment.
Identifiers: *Glucose, *Acetate, Dosing.

Laboratory-scale recirculatory channels incorporating control of water velocity, flow, temperature, and nutrient content were constructed for the study of sewage fungus. The channels were innoculated with fungi, primarily sphaerotilus natans, and fed influents with varying concentrations of phosphates, nitrates, glucose, and total organic carbon. Limiting concentrations for both glucose and acetate were 1 mg/l. Phosphate concentration in the influent had no effect over the range of 0.04 to 0.50 mg P/l, a range encompassing most naturally occurring concentrations it was therefore considered unlikely the phosphate concentration limited slime activity in natural waters. At higher phosphate concentration, there were indications that some other mechanism of phosphate removal was present, since not all of the phosphorous was incorporated in the slimes. The results of these small scale experiments compared favorably with larger scale channels and data taken from natural waters, thus establishing the importance of such lab-scale models in slime studies. (Lowry-Texas)
W71-12720

TREATMENT OF SETTLED DOMESTIC SEWAGE AT HIGH RATES,
Water Pollution Research Lab., Stevenage (England).
A. G. Boon.
Effluent and Water Treatment Journal, Water Pollution Research Laboratory Reprint No. 584, February 1970. 6 p, 5 fig, 1 tab, 7 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Contact stabilization, *Aeration, Sewage effluent, Waste assimulative capacity, *Sewage treatment, Treatment facilities.

Experiments comparing conventional activated sludge plants with a contact stabilization plant of the same aeration capacity were conducted. Both plants were operated at a constant flow rate of 0.062 cubic meters per hour of supernatant from settled domestic sewage. Contact stabilization plants produced an effluent of consistently high quality, 30:20, with contact times as short as 1.2 hours and return sludge aeration time of 0.5 hours. Little nitrification was achieved. The conventional plant produced an effluent of 30:35 quality with retention times of 1.7 hours. In both plants, the per cent of BOD removed was constant up to BOD loadings of 1.4 kg/kg day. Measured respiration rates of the activated sludges supports the hypothesis of Siddiqui et al that over aeration of activated sludge results in inactivation or loss of previously induced enzyme systems. These experiments will be continued to determine the effect of representative variations in hydraulic loading over periods of 24 hours. (Goessling-Texas)
W71-12723

SOME SPECULATIONS ON THE DEVELOPMENT OF NONBIOLOGICAL METHODS OF SEWAGE TREATMENT,
Water Pollution Research Lab., Stevenage (England).
G. E. Eden.
Effluent and Water Treatment Convention, 1969. 6 p, 4 tab, 9 ref, Water Pollution Research Laboratory Reprint No. 563.

Descriptors: *Waste water treatment, *Water treatment, Activated sludge, Trickling filters, Sand, Membranes, Reverse osmosis, Water reuse, Industrial wastes, Sludge, Ammonia, Toxicity, *Sewage treatment.
Identifiers: *Combined treatment, Chemical coagulation, *Chemical treatment, Physico-chemical treatment.

If water treatment costs are added to those for the treatment of sewage to the level required by the receiving authority, waste water reclamation processes considered prohibitively expensive in the past may become more attractive. Possible alternatives are: (1) chemical treatment followed by high rate biological treatment and (2) high rate biological treatment followed by chemical treatment and sand filtration. Available methods of physico-chemical treatment discussed are distillation, coal filters, high temperature oxidation and chemical coagulation followed by reverse osmosis. Improved sludge conditioning processes and incineration techniques promise improvements in this aspect. Conventional physico-biological sewage treatment will remain in the standard method of waste water treatment. However, in specific applications, combinations of physical, chemical and biological treatment of sewage may have a part to play. (Goessling-Texas)
W71-12725

RECENT DEVELOPMENTS IN WATER RECLAMATION,
Water Pollution Research Lab., Stevenage (England).
G. E. Eden, T. D. Hodgson, and A. M. Jones.
The Chemical Engineer, January/February 1970, pCE24-CE29, 2 fig, 3 tab, 17 ref, Water Pollution Research Laboratory Reprint No. 593.

Descriptors: *Waste water treatment, Water quality control, *Tertiary treatment, Coagulation, Filters, Sand, Reverse osmosis, *Electrodialysis, *Ion exchange, *Ozone, *Sewage effluents.

Sewage effluent of good quality can be used for many industrial purposes without further treatment. Other use requires further treatment using processes similar to those employed at water works, chemical coagulation and sand filtration. Modifying this treatment to include ozonation has shown advantages by producing clear, virtually sterile water. Work to date has been on the pilot scale level. Advanced treatment processes, electrodialysis, ion exchange resins, and reverse osmosis are being tested in the U. S. and in England. Results to date have been excellent and indicate that some of the problems associated with these approaches are being solved. Scaled up cost estimates for electrodialysis and ion exchange treatments are 16 and 17.6 cents per 1000 U. S. gallons in a 10 MGD plant. Disposal of residues from these processes is not discussed. (Goessling-Texas)
W71-12727

TURNING SLUDGE INTO A RESOURCE,
Illinois Environmental Protection Agency, Springfield.
For primary bibliographic entry see Field 05E.
W71-12729

THE EFFECT OF CILIATED PROTOZOA ON THE FATE OF ESCHERICHIA COLI IN THE ACTIVATED SLUDGE PROCESS,
Water Pollution Research Lab., Stevenage (England).
C. R. Curds, and G. J. Fey.
Water Research, Vol 3, p 853-867, 1969. 2 tab, 18 ref, 15 p, 5 fig, Water Pollution Research Laboratory, Reprint No. 577.

Descriptors: *Coliforms, *Protozoa, *Waste water treatment, *Activated sludge, Laboratory tests, Aeration, Flow rates, Autoclaves, Domestic wastes, Biochemical oxygen demand, Chemical oxygen demand, *E coli, Microorganisms, Sludge treatment.
Identifiers: *Clarification.

Two bench scale activated sludge plants were constructed so as to allow sterile conditions to be preserved with regards to incoming feed. One unit was then operated without having any protozoa present, and ciliated protozoan organisms were then added to the second unit and the results compared. With protozoa absent, the half-life of the coliform organisms was calculated at 16 hours. Addition of protozoa reduced this half-life to 1.8 hours within a very short time. Some death of E. coli in the sludge which was free from protozoa was also observed, but the cause was not established. A decrease in the total viable bacteria count was also observed when the protozoa were added, confirming the important role of the protozoa in the clarification of sewage effluent. (Lowry-Texas)
W71-12732

ORGANO-CHLORINE INSECTICIDES IN WATER--PART II,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05A.
W71-12733

QUALITY CONSIDERATIONS IN SUCCESSIVE WATER USE,
Colorado Univ., Boulder. Dept. of Civil Engineering.
K. D. Linstedt, E. R. Bennett, and S. W. Work.
Water Pollution Control Federation Journal, Vol 43, No 8, p 1681-1694, August 1971. 2 fig, 7 tab, 17 ref.

Descriptors: *Water reuse, *Reclaimed water, *Waste water treatment, Colorado, Water quality, Tertiary treatment, Standards, Sewage treatment, Irrigation water, Municipal water, Cooling water.
Identifiers: *Denver (Colo).

In wastewater renovation and reuse, water quality can be coupled to the quality requirements for the

type of reuse practiced. Irrigation, industrial, and potable uses have very well-defined quality requirements. Comparisons of effluent quality with various use standards were conducted at Denver. Nutrient removal, suspended solids removal, organic removal, dissolved organic removal, and microorganism removal can be used to meet various standards. Denver effluent could be brought to irrigation standards for $0.0026 to $0.0052/1,000 liters; to low-pressure boiler feedwater standards for $0.026 to $0.029/1,000 liters; to cooling water standards for $0.011 to $0.013/1,000 liters; and to potable water standards for $0.046 to $0.112/1,000 liters. (Knapp-USGS)
W71-12801

POPULATION DESCRIPTION OF THE NON-METHANOGENIC PHASE OF ANAEROBIC DIGESTION: IV. INTERMEDIARY METABOLISM OF NON-METHANOGENIC BACTERIA,
National Inst. for Water Research, Pretoria (South Africa).
D. F. Toerien, and J. P. Kotze.
Water Res. 4 (4): 315-326, Illus, 1970.
Identifiers: Amino-Acid, Anaerobic, Bacteria, Catabolism, Citric-Acid, Cycle, Description, Digestion, Fructose-1, Fructose-6, Glucose, Intermediary, Ketolase, Kinase, Metabolism, Non-Methanogenic, Phase, Phosphate, Phospho, Population.

The intercellular substrate flow in numerically important non-methanogenic bacteria isolated from anaerobic digesters apparently proceeds, with minor modification, through the generally known metabolic pathways. Glycolytic enzymes occurred in all isolates examined and the evidence suggests that the enzyme fructose-1-phosphate kinase might be a constitutive enzyme of more bacterial taxa than previously suspected. The citric acid cycle, or part of it, occurred in all the isolates examined. This cycle may have participated in the formation of propionate as metabolic end-product in many isolates. The fructose-6-phosphate phosphoketolase pathway apparently contributed to glucose catabolism in bifid-like isolates, and an active amino acid metabolism probably occurred in all isolates.--Copyright 1971, Biological Abstracts, Inc.
W71-12926

PYROLYZED SEWAGE SLUDGE: ITS PRODUCTION AND POSSIBLE UTILITY,
University of Western Ontario, London. Dept. of Engineering Science.
John M. Beeckmans, and Park C. Ng.
Environ Sci Technol. 5 (1): 69-71, Illus, 1971.
Identifiers: Activated, Adsorption, Charcoal, Chemical, Coconut, Oxygen, Production, Pyrolyzed, Sewage, Sludge, Tertiary, Utility, Waste, Water.

Filtered sludge from a municipal activated sludge plant was pyrolyzed in a continuous-feed, multiple-hearth furnace. The C content of the pyrolysate under optimum operating conditions was 14.1%. The pyrolysate was crushed 70 to 100 mesh, and its ability to adsorb COD (chemical oxygen demand) and the dye crystal violet was measured. Parallel adsorption tests were made with fly ash and activated coconut charcoal. The pyrolysate was intermediate in adsorbing capacity between fly ash and activated coconut charcoal for both adsorbates, suggesting that it could prove useful as a tertiary treatment agent in waste water renovation.--Copyright 1971, Biological Abstract, Inc.
W71-12928

ACTIVATED SLUDGE DEWATERING: FACTORS AFFECTING DRAINABILITY,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
C. W. Randall, J. K. Turpin, and P. H. King.
J Water Pollu Contr Fed. 43 (1): 102-122, Illus, 1971.
Identifiers: Activated, Biochemical, DE, Drainability, Drainage, Enzyme, Gravity, Oxygen, Sludge, Watering.

Gravity drainage from waste-activated sludge occurs in 2 steps: settling and compacting, and development of drainage pores in the settled sludge. Depths up to 8 in. (20.4 cm) have little effect on rate. Both total drainage and drainage rate decrease rapidly with increasing solids concentration up to 2.5%, but the effect diminishes thereafter and is negligible at about 3%. Amount of water retained per unit solids is maximum at 2.0 to 2.5%. Waste-activated sludges are least dispersed and therefore most drainable at mixed liquor BOD's (biochemical oxygen demand) of about 600 mg/l. Enzyme activity levels of less than 0.6 micro moles/g solids indicated low water retention. Alkalinity and extracellular carbohydrates tend to improve drainage rates.--Copyright 1971, Biological Abstracts, Inc.
W71-12929

EFFECTS OF AERATION TIME ON SOLUBLE ORGANICS DURING ACTIVATED SLUDGE TREATMENT,
Geological Survey, Washington, D.C. Water Resources Div.
David A. Rickert, and Joseph V. Hunter.
J Water Pollu Contr Fed. 43 (1): 134-138, Illus, 1971.
Identifiers: Activated, Aeration, Bacteria, Carbon, Chemical, Organic, Organics, Oxygen, Sludge, Soluble, Time.

The effects of aeration time on soluble organic strength parameters were studied during the conventional activated sludge treatment of domestic sewage. Plug flows of primary effluent were sampled over 6-hr aeration periods, and the soluble fraction of each sample was analyzed for TOC (total organic carbon) and COD (chemical oxygen demand). Soluble TOC was reduced to a relatively stable level after 30 min of aeration, with a 70% average reduction in initial concentration. Soluble COD was reduced to a relatively stable level after 1 hr of aeration, with average reduction of 77%. COD:TOC ratios decreased steadily over the 1st hr of aeration and fluctuated irregularly thereafter. Comparison of COD:TOC ratios to TOC data suggested that a transfer of soluble organics occurred between the aqueous phase and bacteria over the aeration interval from 30 min to 1 hr. The average oxidation state was estimated for the organic carbon in each sample.--Copyright 1971, Biological Abstracts, Inc.
W71-12930

STUDIES ON THE TOTAL OXIDATION OF ACTIVATED SLUDGE WITH AND WITHOUT HYDROLYTIC PRETREATMENT,
Oklahoma State Univ., Stillwater. Dept. of Biochemistry and Water Resources.
A. F. Gaudy, Jr., P. Y. Yang, and A. W. Obayashi.
J Water Pollu Contr Fed. 43 (1): 40-54, Illus, 1971.
Identifiers: Activated, Aeration, Extended, Hydrolytic, Metabolism, Microbial, Oxidation, Pre, Rupture, Sludge, Ultrasonic.

Earlier studies suggested that extension of the scope of application of the extended aeration process was a possibility. Results reported here indicate that the concept of total (biological) oxidation of sludge that has been biologically synthesized is not inconsistent with sound microbiological principles. Organic material from cell interior was obtained by ultrasonic rupture of the cell wall. The soluble portion was fed as a shock loading to the pilot plant. Analysis showed a 90% organic removal (as determined by chemical oxygen demand). Cells grown from seed from the pilot plant were hydrolyzed separately and fed to the pilot plant as a source of carbon. Test data indicated the sludge had no difficulty metabolizing the hydrolyzed sludge. A process modification is presented that would permit the wider use of extended aeration.--Copyright 1971, Biological Abstracts, Inc.
W71-12931

EFFECT OF DISSOLVED OXYGEN AND SUBSTRATE CONCENTRATION ON THE UPTAKE RATE OF MICROBIAL SUSPENSIONS,
Environmental Control Dept., Oakland, Calif.
A. A. Kalinske.
J Water Pollu Contr Fed. 43 (1): 73-80, 1971.
Identifiers: Activated, Aeration, Biochemical, Concentration, Dissolved, Microbial, Oxygen, Rate, Sludge, Substrate, Suspensions, Tanks, Uptake, Waste, Water.

The activated sludge process, although known and used for 50 yr, still involves empirical and 'rule-of-thumb' knowledge as to what actually takes place. The engineer has difficulty in understanding, using, and controlling, the process efficiently. Transfer of dissolved oxygen (DO) into liquid wastes, microbial suspensions, respiration rates, liquid-solids separation, DO concentration, agitation control, mechanical surface aerators vs. diffused air, and current experimental research on the use of pure oxygen all bear on the required knowledge about and application of the effective and efficient use of the activated sludge process.--Copyright 1971, Biological Abstracts, Inc.
W71-12932

HYDRAULICALLY CONTROLLING SOLIDS RETENTION TIME IN THE ACTIVATED SLUDGE PROCESS,
Yoder-Trotter. Orlob and Associates, Walnut Creek, Calif.
Larry F. Walker.
J Water Pollu Contr Fed. 43 (1): 30-39, Illus, 1971.
Identifiers: Activated, Biochemical, Controlling, Hydraulically, Methods, Optimal, Oxygen, Process, Retention, Sludge, Solids, Time, Waste, Water.

Solids control in the operation of the activated sludge process is vital. The hydraulic method of solids control is effective, simple, and has particular application in smaller plants with limited personnel. It has advantages over the most commonly used method of maintaining a constant mixed liquor suspended solids level. The fixed solids method of control does require a minimum of laboratory control but ignores the factor of food-to-microorganism ratio. A 2nd control method involves this ratio or, in other terms, the biochemical oxygen demand:violatile suspended solids ratio. A 3rd control method involves maintaining a constant solids retention time in the system. The latter is generally preferred because it produces the best effluent with a minimum amount of laboratory control work required. The hydraulic control method involves controlling solids retention time, no laboratory work, and only knowledge of plant flow and the sludge return rate. The use of such a control system is explained by actual plant examples.--Copyright 1971, Biological Abstracts, Inc.
W71-12933

PENNSYLVANIA SEWAGE FACILITIES ACT.
For primary bibliographic entry see Field 06E.
W71-12955

SEWAGE DISPOSAL PLANTS IN CITIES AND TOWNS.
For primary bibliographic entry see Field 06E.
W71-12956

MEMBRANE SCIENCE AND TECHNOLOGY: INDUSTRIAL, BIOLOGICAL, AND WASTE TREATMENT PROCESSES,
James E. Flinn.
Symposium, 234 p, Illus, Plenum Press: New York, N. Y., London, England. 1970. $11.00.
Identifiers: Biological, Book, Industrial, Membrane, Processes, Science, Symposium, Technology, Waste.

This book is a collection of papers derived from a conference on membranes held at the Columbus Laboratories of Battelle Memorial Institute in Columbus, Ohio, on Oct. 20 and 21, 1969. Research reported relates to the membrane fields,

namely, membrane synthesis, polymer chemistry and technology, food product development and processing, biochemistry, biomedical engineering and environmental waste management. Membrane technology as a processing tool is analyzed considering its use in industries with separation problems of a common nature: those manufacturing food, fermentation, medicinal and biological products using membranes to fractionate, purify or concentrate primarily aqueous solutions containing small dissolved ionic and neutral solutes and much higher molecular weight compounds, e.g., proteins, enzymes and viruses. Problems are dealt with such as cake buildup on the membrane, surface, clogging of pores, adsorption in and on the membrane, rheological limitations on the mass transfer of solute and solvent due to viscosity, shear and non-Newtonian fluid effects. The 1st 2 papers discuss phenomena relating to the transport of both large and small organic solutes within and through polymeric membranes. The next 5 papers apply to membranes in solutions where macromolecular compounds, principally of biological origin, must be separated, purified of dissolved ions or fractionated. The following 2 papers were concerned with the transport of small dissolved ions for the production of chemicals and prospective hydrometallurgical separations. The final 4 papers describe the application of membrane processes to industrial water and waste treatment situations; the recovery of water and the chemicals for recycle are the 2 needs which are stressed.--Copyright 1971, Biological Abstracts, Inc.
W71-12961

WATER POLLUTION CONTROL FACILITIES, TAX EXEMPTION.
For primary bibliographic entry see Field 06E.
W71-12986

THE VIABILITY OF SALMONELLA IN THE MANGANESE-IRON SLUDGE OF URBAN WATERWORKS.
H. Woratz, and G. Bosse.
Gesundheitsw Desinfek. 60 (7): 97-100. 1968.
Identifiers: Chlorine, Contamination, Germany, Hannover, Iron, Manganese, Pipe, Pseudomonas, Salmonella, Sludge, Urban, Viability, Waterworks.

The routine bacteriological examination of an urban water works in Hannover disclosed an occasional increase in the bacterial count which was difficult to explain because the water at the source was free of bacteria. Due to a high Fe and Mn content, the water was treated using chlorine oxidation. Even with Cl contents of 0.1-0.3 mg/l, the bacterial count remained high. A bacteriological examination of the black sludge in the water main disclosed the presence of 3 strains of Pseydomonas (optimal growth temperature was 15-20 C). The dry sludge contained 30% organic material, 32% Mn)2, 7%iron oxide, 11% Ca2CO3 and 5% SiO2. Chlorination affected only the surface of the deposit; inside the deposit the bacterial flora remained unaffected and represented a danger of infection. Such deposits consequently must be removed from pipes carrying drinking water.--Copyright 1971, Biological Abstracts, Inc.
W71-12991

MICROFLORA OF THE FACTORY BROTH AND WASTE WATER IN TANNERY INDUSTRY.
Sarajevo Univ. (Yugoslavia). Biološki Institut.
Bosiljka Ristanovic.
Acta Biol Jugoslav Ser B Mikrobiol. 7 (1): 69-80. Illus. 1970. (Engl. and Ger. summ.).
Identifiers: Actinomycetes, Bacteria, Broth, Factory, Flora, Fungi, Industry, Micro, Tannery, Waste, Water.

The species of bacteria, actinomycetes and fungi in 2 tannery waste broths, sedimentary basins and outlet tubes for waste waters were isolated and determined, and results obtained are discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12992

BALLAST WATER TREATMENT: A MAJOR UNDERTAKING.
State of Alaska. Dept. of Health and Welfare, Juneau.
For primary bibliographic entry see Field 05G.
W71-13049

LABORATORY INVESTIGATION INTO THE SINKING OF OIL SPILLS WITH PARTICULATE SOLIDS.
Shell Research Ltd., Egham (England). Egham Research Labs.; and Koninklijke/Shell-Laboratorium, Amsterdam (Netherlands).
For primary bibliographic entry see Field 05G.
W71-13063

ASSESSMENT OF OIL SPILL TREATING AGENT TEST METHODS.
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05G.
W71-13065

MICROBIAL DEGRADATION OF A LOUISIANA CRUDE OIL IN CLOSED FLASKS AND UNDER SIMULATED FIELD CONDITIONS.
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 05G.
W71-13069

THE RECOVERY OF OIL FROM WATER WITH MAGNETIC LIQUIDS.
Avco Corp., Lowell, Mass. Systems Div. and Purdue Univ., Lafayette, Ind., and Massachusetts Inst. of Tech., Cambridge.
R. Kaiser, G. Miskolczy, R. A. Curtis, and C. K. Colton.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 415-426, 11 fig, 3 tab, 10 ref.

Descriptors: Water pollution control, Oil, Oily water, *Reclamation, *Separation techniques, Magnetic studies, Cost analysis, *Oil wastes.
Identifiers: Oil spills, Ferro-fluids, *Magnetic separation.

The principles of removing oil from water by magnetic means are discussed. The oil-water separation can be affected by adding a ferro-fluid miscible with one of the phases, usually the oil phase, to the mixture. A ferrofluid is a stable magnetically responsive colloidal dispersion of superparamagnetic particles. Adding a ferrofluid to miscible liquid renders the mixture magnetically responsive. Thus, when an oil-soluble, water insoluble ferrofluid is added to an oil-water mixture, magnetic properties are conferred to the oil phase alone. When the mixture is passed through a suitable device in which a magnetic field is generated, a selective magnetic body force is exerted on the oil which is retained within the device while the water passes through. Based on these principles, the different types of equipment required to separate an oil-water emulsion and to remove an oil spill from the ocean surface have been considered. Preliminary results and economic projections are presented. (See also W71-12588) (Misra-PAI)
W71-13082

5E. Ultimate Disposal of Wastes

GROUND DISPOSAL OF PESTICIDES: THE PROBLEM AND CRITERIA FOR GUIDELINES.
Working Group on Pesticides, Rockville, Md.

Available as PB-197 144 from NTIS, Springfield, Va. 22151 - $3.00 paper copy, $0.95 microfiche Working Group on Pesticides Report WGP-DR-1, March 1970. 55 p, 3 tab, 8 ref, 5 append.

Descriptors: *Pesticides, *Waste disposal, *Soils, *Water pollution sources, *Groundwater movement, Aquifer characteristics, Soil water, Landfills, Urbanization, Rural areas, Monitoring, Planning, Hydrologic aspects, Lagoons, Toxins, Decision making.
Identifiers: *Pesticide disposal, *Criteria, Waste parameters.

The problem of ground disposal of pesticides is stated and the extent of contamination in wells and in groundwater is examined. Types of pesticide waste are discussed and the interactions between pesticides and soils and groundwater are considered. Criteria are provided for establishing guidelines on disposal of pesticides and their containers, selection of disposal zone, site maintenance, and monitoring regulations. Magnitude of contamination threat to groundwater resources from improper disposal is dependent upon the physical, chemical, biological and toxicological properties of the pesticide waste, the hydrological characteristics of the disposal site and the volume, state (liquid or solid), and persistence of the waste. The technology of occurrence and movement of groundwater is so well developed that it should be applied to each individual disposal site, to the type of pesticide wastes, and to the method under consideration. Evaluations should be conducted by qualified and experienced professionals actively practicing in this field. Nine recommendations are offered by the Ground Disposal Task Group. (Lang-USGS)
W71-12356

CHEMICAL WASTES IN THE SEA: NEW FORMS OF MARINE POLLUTION.
Rijksinstituut voor de Volksgezondheid, Utrecht (Netherlands). Lab. of Toxicology.
For primary bibliographic entry see Field 05B.
W71-12476

DENSITY CURRENTS AND TURBIDITY CURRENTS IN WASTE DISPOSAL IN THE OCEAN--A LITERATURE REVIEW.
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-12665

OCEAN DISPOSAL OF SOLID WASTES.
Environmental Protection Agency, Washington, D.C.
Lynn P. Wallace.
In: Pollution Control and the Marine Industry, Ives, Joseph S., editor. Conference sponsored by the International Association for Pollution Control, New Orleans, April 1-3, 1971. p 17-1 -- 17-9.

Descriptors: *Solid wastes, *Waste disposal, *Water pollution control, *Reclamation, *Landfill, Water pollution sources, Permits.
Identifiers: Ocean dumping.

The wastes that are barged and dumped are called solid wastes. Air pollution regulations have made incineration of municipal and industrial solid waste increasingly expensive and much of it is dumped into the ocean. Recent studies on the subject have recommended setting up a permit system to regulate dumping of materials into the ocean. Among the possible answers to the solid waste problem are resource recycling and reuse, sanitary land filling, composting, and improved incineration techniques. (Ensign-PAI)
W71-12712

TURNING SLUDGE INTO A RESOURCE.
Illinois Environmental Protection Agency, Springfield.
R. B. Ogilvie.
Environment: Illinois, p. 1-4, January 1971. 4 p, 3 photo.

Descriptors: *Illinois, *Sewage sludge, *Sewage treatment, *Sludge disposal, Anaerobic digestion, State governments, Research and development, Research facilities, Municipal wastes, Domestic wastes, Sanitary engineering, Waste treatment, Biological treatment, Sewage disposal, Biodegradation, Sludge digestion, Anaerobic bacteria, Fertilizers, Fertilization, Landfills, Land reclamation, Non-structural alternatives.

Illinois will no longer tolerate the dumping of sewage into its waterways and lakes. New sewage treatment facilities are being built now. Illinois is now seeking the development of valuable uses of sewage. In experimental programs raw sewage is turned into a sludge by anaerobic digestion. This sludge has valuable uses as both a land fill and fertilizer. Many such projects are currently being undertaken with very favorable results. Pipelines will probably be the solution to low cost distribution of this sludge. The next steps to be undertaken are to solve the problem of distribution costs, to locate and acquire disposal and land development tracts, to encourage farm use of sludge fertilizer, and to continue scientific monitoring. (Robinson-Florida)
W71-12729

OCEAN WASTE DISPOSAL.
United States Senate Committee on Commerce, Washington, D.C. Subcommittee on Oceans and Atmosphere.

Hearings - Subcomm on Oceans and Atmosphere - Comm on Commerce, US Senate, 92d Cong, 1st Sess, March 2, 3; April 15, 21, 22, 28, 1971. 340 p, 4 fig, 23 tab, 1 chart, 70 ref.

Descriptors: *Federal government, *Legislation, *Oceans, *Waste disposal, Pollution abatement, Water pollution sources, Water pollution, Water quality control, Water pollution control, Water pollution effects, Wastes, Pollutants, Ships, Waste dumps, Coasts, Sea water, International waters, Administrative agencies, Regulation, Permits, Rivers and Harbors Act, Legal aspects, Environmental effects, Federal jurisdiction.

In order to prevent the indiscriminate dumping of pollutants into the oceans and coastal waters of the United States, the Senate Committee on Commerce, Subcommittee on Oceans and Atmosphere, heard testimony on four proposed bills, set forth herein, regulating such dumping. One bill would foster oceanic and environmental research and development through the creation of new administrative agencies. Another bill would regulate the discharge of wastes in territorial and international waters for five years after its enactment and prohibit such discharges thereafter. The third bill would regulate the dumping of material in oceanic and coastal waters through the Environmental Protection Agency. The last bill herein presented would place an immediate ban on the loading of material on vessels for dumping in oceanic waters. Discussion in the hearings centered on the division of authority, under the various bills, between the Environmental Protection Agency and the Corps of Engineers, which has regulatory power through permit issuance under the Rivers and Harbors Act. There was also major disagreement among the witnesses as to the desirability of an immediate ban on ocean dumping as opposed to a phased reduction. Various research reports are included. (Smiljanich-Florida)
W71-12776

WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 05G.
W71-12777

RARDIN V MARCOTTE (INJUNCTIVE RELIEF AGAINST SEWAGE PLANT DISCHARGES).
For primary bibliographic entry see Field 06E.
W71-12988

LICENSE FOR VEHICLES CARRYING WASTE; EQUIPMENT CARRYING WASTE.
For primary bibliographic entry see Field 06E.
W71-13001

5F. Water Treatment and Quality Alteration

ELECTROCHEMICAL ACTIVATION AND REGENERATION OF CARBON SURFACES FOR TERTIARY WATER TREATMENT,
Virginia Polytechnic Institute and State Univ., Blacksburg. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05D.
W71-12324

THE PRINCIPLES AND PRACTICE OF PRETREATMENT FOR ARTIFICIAL RECHARGE,
Water Research Association, Marlow (England).
D. G. Miller, and A. Hunter Blair.
Paper No 4 of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970: The Water Research Association, Marlow, England. 23 p, 2 tab, 23 ref.

Descriptors: *Water treatment, *Artificial recharge, *Pit recharge, *Filtration, Coagulation, Adsorption, Suspended load, Water reuse, Reclaimed water, Solutes, Dissolved oxygen, Salinity.

In selecting suitable pretreatment methods for basin recharge, account must be taken not only of the achievement of economic recharge rates by minimizing clogging but also of the necessary conditioning of lower quality waters to protect underground supplies and aquifers. To assess pretreatment requirements for water quality purposes it is necessary to have adequate data on the reliable purification afforded by infiltration. Pilot scale investigations are needed to understand the generalized mechanism involved. Principal requirements for most recharge waters are for suspended solids reduction and aeration. Considerable care is needed when recharging polluted waters, especially those containing industrial wastes, to prevent aquifer contamination. Where potable water is concerned particular care must be taken with contaminants which are not affected by percolation or where removal cannot be assured. These include iron, manganese, aluminum, heavy metals, inorganic salts, ammonia, and persistent insecticides. Of the pretreatment methods available for suspended soilids removal the various forms of deep bed filtration would seem to have an acceptable combination of removal efficiency and cost. Other methods are likely to be too efficient and too expensive. (Knapp-USGS)
W71-12407

FUNDAMENTAL VARIATIONS IN THE WATER QUALITY WITH PERCOLATION IN INFILTRATION BASINS,
Institute for Water Research Ltd., Dortmund (West Germany).
For primary bibliographic entry see Field 04B.
W71-12410

CONTAMINATION OF SURFACE WATER: VIROLOGICAL ASPECTS, (IN ITALIAN),
Milan Univ. (Italy). Inst. of Hygiene.
For primary bibliographic entry see Field 05B.
W71-12565

HYGIENIC SITUATION OF THE COASTAL SEA-WATERS OF NORTH SARDINIA WITH REFERENCE TO THE INDUSTRIAL AND SEWAGE POLLUTION, (IN ITALIAN),
Sassari Univ. (Italy). Istituto di Igiene.
For primary bibliographic entry see Field 05B.
W71-12567

HYGIENIC CHEMICAL STUDIES ON EFFLUENT WATER: VI. FUNDAMENTAL STUDIES ON HYGIENIC CHEMISTRY OF BRACKISH LAKE, (IN JAPANESE),
Ibaraki Prefecture Inst. of Public Health, Mito, (Japan).
For primary bibliographic entry see Field 05C.
W71-12568

FLUORIDATION STUDIES AND DENTAL CARIES: A REVIEW,
Eastman Dental Center, Rochester, N.Y.
J. Murray.
Brit Dent J. 129 (10): 467-470. Illus. 1970.
Identifiers: Caries, Dental, Fluoridation, Human, Review.

Baseline studies and final reports of the major fluoridation studies so far published are drawn together and the progress of fluoridation as a world-wide public health measure is outlined.—Copyright 1971, Biological Abstracts, Inc.
W71-12573

VIRUS RETENTION BY MEMBRANE FILTERS,
University Coll. London (England). Dept. of Civil Engineering.
J. E. Scutt.
Water Research, Vol 5, No 5, p 183-185, May 1970. 1 tab, 11 ref.

Descriptors: *Filtration, *Virus, *Membranes, Pressure, Flow rate, Adsorption, Separation techniques, Nitrogen, Detergents, Incubation, Water quality control, Public health, Filters, Water treatment.
Identifiers: *Phosphate buffer.

Attenuated strains of poliovirus type I and reovirus type I strain 716 were suspended and filtered at various rates through membranes under conditions otherwise favorable for virus adsorption. The membranes used were 47 mm type HA (Millipore Corp.) of 0.45 micro m pore size made of mixed esters of cellulose. Filtrations were carried out under nitrogen pressures of up to 53.3 kNm-2 (400 mm Hg). Essentially all of the reovirus was retained at varying filtration rates, but the retention of poliovirus was demonstrated to be clearly rate dependent. Results showed that any membranes having pore sizes larger than the virus being filtered behaved as depth filters. Virus penetration followed a modified form of the Iwasaki equation: G (C1-C2) — K delta C1m where G — flow rate, C1 and C2 are the inlet and outlet concentrations, K is a constant, and C1m the log mean concentration. Depending on operational conditions, very high levels of removals can be obtained, but the filter cannot be counted on to retain all of the virus. It is therefore possible that alternative methods might prove superior. (Lowry-Texas)
W71-12715

SAFE DRINKING WATER.

Hearings on House Bills 1093, 5454, and 437--Subcomm. on Public Health and Environment--Comm. on Interstate and Foreign Commerce, U.S. House of Representatives, 92d Cong, 1st Sess, May 24, 25, and 26, 1971. 673 p, 24 fig, 91 tab, 120 ref, 10 append.

Descriptors: *Potable water, *Public health, *Standards, *Legislation, Federal government, Administrative agencies, State governments, Water pollution, Water pollution control, Water pollution effects, Water pollution treatment, Water quality, Water quality control, Epidemiology, Human diseases, Recreation, Safety, Sanitary engineering, Vectors (Biology), Water purification, Desalination, Domestic water, Environmental sanitation.

The proposed National Water Hygiene Act of 1971 and Pure Drinking Water Act are reproduced verbatim in this report of hearings before a House subcommittee. The Water Hygienne Act is designed to provide the public with an adequate quantity of

safe water for drinking, recreation, and other human uses, while the Pure Drinking Water Act would improve and implement programs to assure adequate quantities of safe water by protection from chemical, biological, and physical contaminants. The remainder of the hearing report is devoted to statements by representative of various federal and state administrative agencies and additional material submitted for the record by interested government and private organizations. Subjects dealt with include: (1) community water supply study analysis of national survey findings; (2) a waterborne epidemic of salmonellosis in Riverside, California, 1965; (3) the effect of chlorination on human euteric viruses in partially treated water from the Potomac estuary; (4) the effectiveness of water treatment processes on viruses; (5) Public Health Service Drinking Water Standards; (6) health and safety of the public at outdoor recreation areas; and (7) major current desalting operations. (Hart-Florida)
W71-12769

A WATERBORNE EPIDEMIC OF SALMONELLOSIS IN RIVERSIDE, CALIFORNIA, 1965. A COLLABORATIVE REPORT.
For primary bibliographic entry see Field 05C.
W71-12934

SEWER AND DRAIN SWABBING AS A MEANS OF INVESTIGATING SALMONELLOSIS,
University Hospital of Wales, Cardiff.
For primary bibliographic entry see Field 05B.
W71-12935

INTRATYPIC DIFFERENTIATION OF POLIOVIRUS STRAINS ISOLATED FROM SEWAGE: CONSEQUENCES FOR THE PRACTICE OF ORAL VACCINATION,
Institut fuer Medizinische Mikrobiologie, Essen (Germany).
For primary bibliographic entry see Field 05B.
W71-12936

ADAPTATION OF THYROID FUNCTION TO IODINE INTAKE IN BUENOS AIRES,
Buenos Aires Univ. (Argentina).
For primary bibliographic entry see Field 05C.
W71-12978

ISOLATION OF SALMONELLA TYPHI-MURIUM FROM MUNICIPAL WATER, RIVERSIDE, CALIFORNIA, 1965,
Emory Univ., School of Medicine. Atlanta, Ga.
John R. Boring, III, William T. Martin, and Laura M. Elliott.
Amer J Epidemiol. 93 (1): 49-54. Illus. 1971.
Identifiers: California, Epidemic, Escherichia-Coli, Filter, Human, Isolation, Membrane, Methods, Municipal, Riverside, Salmonella-Typhimurium, Technique, USA, Water.

S. typhimurium phage type 2 was isolated from 6 different samples of the municipal water during an epidemic involving over 16,000 persons. Fiver isolations were made using the membrane filter technique and large volumes of water and 1 additional isolation was made by direct inoculation of water in enrichment medium. A sample containing water from all parts of the city was examined quantitatively; salmonellae were 10 times as numerous as Escherichia coli.--Copyright 1971, Biological Abstracts, Inc.
W71-12990

THE EFFECT OF FREE CHLORINE OF THE ORGANISM IN DRINKING WATER,
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 05C.
W71-13004

5G. Water Quality Control

OIL SPILL TREATMENT WITH COMPOSTED DOMESTIC REFUSE,
Westinghouse Research Labs., Philadelphia, Pa.
Walter G. Vaux, Stephen A. Weeks, and Donald J. Walukas.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 303-305, 1 tab, 4 ref.

Descriptors: *Water pollution treatment, Oil, Oily water, *Cleaning, Reclamation, *Absorption, Domestic wastes, Separation techniques, Water pollution control, *Oil wastes.
Identifiers: Oil spills, Compost.

Floating crude oil can be absorbed and recovered with compost made from domestic refuse. Experiments showed that compost floats on water without wetting until it encounters oil, then absorbs oil at 3.4 ml crude/gram compost (19 barrels/ton). Oil-saturated forms cohesive masses which are easily retrieved from water. Floating masses of oily compost burn vigorously and leave a coke-like residue which sinks. Under water it breaks into small suspended particles which disperse and degrade. Ocean tests have demonstrated that very thin and thick (1.5 mm) films can be treated and removed quickly. (See also W71-12588) (Misra-PAI)
W71-13071

INTERNATIONAL PAPER CO. V BUSBY (DAMAGES TO DOWNSTREAM LANDOWNER CAUSED BY DUMPING OF PULP WASTES INTO RIVER).
For primary bibliographic entry see Field 06E.
W71-12248

THE EFFECTS OF DRAIN WELLS ON THE GROUND-WATER QUALITY OF THE SNAKE RIVER PLAIN,
Idaho Bureau of Mines and Geology, Moscow.
For primary bibliographic entry see Field 02F.
W71-12274

THE OUTLOOK FOR WATER-QUALITY, QUANTITY, AND NATIONAL GROWTH,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-12283

ANDERSON-PRICHARD PIPE LINE CORP V SAXTON (PIPE LINE OPERATOR'S LIABILITY FOR POLLUTING ADJACENT WATER SUPPLIES).
For primary bibliographic entry see Field 06E.
W71-12300

UNITED STATES V THE CATHERINE (LIABILITY OF VESSEL FOR DISCHARGE OF OIL RESULTING FROM AN UNAVOIDABLE ACCIDENT).
For primary bibliographic entry see Field 06E.
W71-12306

THE WATER QUALITY CONTROVERSY IN MINNESOTA AND THE MARGINAL COSTS OF ALTERNATIVE LEVELS OF WATER QUALITY IN THE UPPER MISSISSIPPI RIVER,
Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.
J. J. Waelti, and R. C. Lewis.
Availability from the National Technical Information Service as PB-202 783, $3.00 in paper copy, $0.95 in microfiche. Minnesota Univ., Water Resources Research Center, 1971. 19 p, 1 fig, 4 ref. A-019-MINN (3).

Descriptors: *Water quality control, *Waste water treatment, *Cost sharing, *Mississippi River, Minnesota, Standards, Decision making, Dissolved oxygen, Industry, Costs, Laws, Political aspects, Institutions, Regressive taxes, Zoning, Economic efficiency, Cost analysis, Mathematical models, Institutional constraints, Methodology, Oxygen sag, Cost-benefit analysis.
Identifiers: Cost minimizing plan, Least cost strategy, Cost functions, Effluent charges, Minneapolis-St Paul (Minn), Water quality levels.

The water quality controversy generally, and specifically in the Minneapolis-St Paul area is discussed. The controversy centers around: (1) the methods of obtaining various levels of water quality, (2) the level of water quality that should be attained and (3) the institutional means of instituting policy. A linear programming model was used to find the lowest cost methods of achieving alternative dissolved oxygen levels in the Mississippi River in the Minneapolis-St Paul area. It was found that the current water quality standard of 3.43 mg/l dissolved oxygen can be maintained by increasing the BOD removal rate in several sewage treatment plants while the removal rate in others could actually be reduced. With a cost minimizing plan the current river standard could be maintained for an additional annual expenditures of 4.8% or $3.7 million. (Wade-Wisconsin)
W71-12331

RECONNAISANCE STUDY FINANCE, ORGANIZATION, MANAGEMENT NASHUA RIVER WATER QUALITY DEMONSTRATION PROGRAM,
Massachusetts Univ., Amherst. Water Resources Research Center.
Paul Page, David Peretti, and Arnold Schneider.
Available from the National Technical Information Services as PB-202 697, $3.00 in paper copy, $0.95 in microfiche. Univ. of Massachusetts, Amherst, Water Resources Research Center, 1971. 30 p, 12 fig. OWRR Project A-039-MASS (1).

Descriptors: *Water quality, *Regional analysis, *Coordination, River basin development, Planning, Management, Economics, Industry, Local governments, Conservation, Social participation, Land development, Zoning, Land use, Costs, Economic efficiency, Model studies.
Identifiers: *Nashua River (Mass-N H), Shoreland regulation, Regional approaches.

The Nashua River Water Quality Development Program is evaluated after a four-month survey including financing, organization, and managerial aspects. Results indicate that water quality standards can be met at lower costs of both business and public sectors through coordination and cooperation. The conflicting interests of conservationists and developers can be reconciled by cooperation in development of green belts along the Nashua River (Massachusetts-New Hampshire) which will provide both environmentally protected recreation areas and higher land values adjacent to it. Advantage possibilities of a regional planning approach are pointed out. (Wade-Wisconsin)
W71-12332

THE ECONOMICS OF WATER SUPPLY AND QUALITY,
Harvard Univ., Cambridge, Mass. Harvard Water Program.
R. Dorfman, H. A. Thomas, Jr., and H. D. Jacoby.
Copy available from GPO Sup Doc as SN-5501-0070, $0.50; microfiche from NTIS as PB-202 698, $0.95. Environmental Protection Agency, Water Quality Office, Water Pollution Control Research Series 16110, 1971. 37 p, 26 ref. EPA Program 16110 DTF 02/71.

Descriptors: *Water quality, *Economics, *Planning, *Water supply, *Mathematical models, *Regional analysis, Water resources, Analysis, Administration, Decision making, Institutions, River basins, Flow augmentation, Input-output analysis,

Political aspects, Technology, Municipal wastes, Costs, Economic feasibility, Water shortage, Water storage, River basin commissions.
Identifiers: *Computing techniques, Delaware Estuary, Municipal water systems, Planning models, Economic loss, Safe yield, Predictive theory, Uncertainty in supply.

Research on economics of water quality placed emphasis on the interaction of economic, technical, and political factors, with particular attention to the regional quality management authority. A model of a river basin authority was designed with the key concept of the 'Pareto admissible' pollution abatement plan. Attention was devoted to the municipality as a participant in the overall management process as the key aspect of economics of water quality. Problems faced by municipal wastewater managers, municipal evaluation of alternative quality management plans, and the role of municipal decision-makers, municipal decision processes, including cost-sharing schemes, were modeled. Linear programming of estuarine pollution abatement to analyze the economic characteristics of various quality management policies also included a variety of zoning procedures. Computing techniques for basin-wide planning incorporated the political dimension. Quality control costs and application of regional input-output methods and the interdependence between regional economy and water quality control efforts were modeled. A monograph titled 'Models of managing regional water quality' is described. (Auen-Wisconsin)
W71-12333

ATLANTIC PIPE LINE CO V DREDGE PHILADELPHIA (LIABILITY FOR POLLUTION FROM RUPTURE IN SUBMERGED OIL PIPELINE).
For primary bibliographic entry see Field 06E.
W71-12336

A BILL TO REGULATE THE DISCHARGE OF WASTES IN TERRITORIAL AND INTERNATIONAL WATERS.
For primary bibliographic entry see Field 06E.
W71-12337

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT RELATING TO AREA ACID AND OTHER MINE WATER POLLUTION CONTROL DEMONSTRATIONS.
For primary bibliographic entry see Field 06E.
W71-12338

SOME ECONOMIC ASPECTS OF WATER QUALITY ENHANCEMENT,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
Henry R. Hamilton.
Water-1968 (Chemical Engineering Progress Symposium Series), Vol 64, No 90, p 32-38, 1968. 1 fig, 11 ref.

Descriptors: *Economic evaluation, *Computer models, *Water quality, Benefits, Direct benefits, Indirect benefits, Tangible benefits, Intangible benefits, Recreation, Social impact, Social values, Comparative benefits, Value, Aesthetics.
Identifiers: *Water quality enhancement, Regional benefits, Benefits analysis.

Some issues involved in assessing water quality benefits are discussed. Primary and secondary benefits, both tangible and intangible, are described and it is noted that direct benefits need not be tangible. Secondary benefits are defined as regional impact. Tangible and intangible differentiation is evaluated and definitions refined. Modeling the benefit of water quality enhancement requires specification of kinds of benefits that could conceivably be generated; benefits to be gained from intangible classifications probably justify expenditures on water quality enhancement, with recreation and aesthetics cited as the principal intangible components. Benefit measurement is the major tool in cost-benefit analyses. A three-sector model is proposed to determine water quality enhancement benefits: (1) a Population Section, including population variables by age, spatial distribution and water use, (2) an Economic Activity Sector, incorporating employment, income, industrial water demands and spatial distribution variables, and (3) a Water Sector incorporating water quantity and quality variables by location. The problem of measuring the value of pure aesthetics can be considerably resolved by applying common sense plus economic analysis to estimate a useful range of of their value. (Wade-Wisconsin)
W71-12340

ECONOMIC IMPACT OF POLLUTION ABATEMENT,
Federal Reserve System, Washington, D.C. Board of Governors.
A. F. Brimmer.
Presented at 1971 commencement exercises of Miami Univ., Coral Gables, Florida, June 1971. 19 p, 1 tab.

Descriptors: *Federal budgets, *Pollution abatement, *Cost allocation, *Economic impact, Estimated costs, Employment, Inflation (Economic), Indirect costs, Priorities, Environmental sanitation, Installation costs, Industrial production, Forecasting, Social impact, Gross National Product, Investment, Computer models.
Identifiers: Federal Reserve System.

An econometric computer simulation study by the Federal Reserve Board indicates that it will take $16 billion to finance anti-pollution capital investments over the next four or five years assuming a $3 billion investment per year in pollution abatement devices for both new and existing equipment. These costs may produce a substantial drag on the improvement in the material conditions of life of many Americans. While pollution abatement investments would create many new jobs the resulting lower productivity would reduce the GNP growth which would affect per capital incomes of those underdeveloped sectors of our economy which are least able to bear it--the poor, the disadvantaged, and the hard pressed urban communities. Other projected effects of increased investment in pollution abatement were slight reductions in expenditures for plant and residential housing, sizable drops in personal consumption and, most disturbing, a strong inflationary price trend. (Wade-Wisconsin)
W71-12341

WATER AND WATER POLLUTION HANDBOOK, VOLUME 1.
For primary bibliographic entry see Field 02A.
W71-12347

WATER AND WATER POLLUTION HANDBOOK, VOLUME 2.
For primary bibliographic entry see Field 02A.
W71-12355

A BILL TO AMEND THE SMALL BUSINESS ACT TO ENCOURAGE THE DEVELOPMENT AND UTILIZATION OF NEW AND IMPROVED METHODS OF WASTE DISPOSAL AND POLLUTION CONTROL; TO ASSIST SMALL BUSINESS CONCERNS TO EFFECT CONVERSIONS REQUIRED TO MEET FEDERAL OR STATE POLLUTION CONTROL STANDARDS; AND FOR OTHER PURPOSES.
For primary bibliographic entry see Field 06E.
W71-12360

INDUSTRIAL WATER POLLUTION ABATEMENT LOAN ACT OF 1970 (A BILL TO PROVIDE FINANCIAL ASSISTANCE FOR A WATER POLLUTION ABATEMENT PROGRAM FOR INDUSTRIAL WASTES).
For primary bibliographic entry see Field 06E.
W71-12372

RECHARGE OF CARBONACEOUS SALINE AQUIFER OF SOUTH FLORIDA WITH TREATED SANITARY WASTEWATER,
Black, Crow and Eidsness, Inc., Gainesville, Fla.
J. I. Garcia-Bengochea.
Supporting Paper C of Artificial Groundwater Recharge Conference, University of Reading, England, September 21-24, 1970: The Water Research Association, Marlow, England. 14 p, 5 fig, 1 tab, 9 ref.

Descriptors: *Tertiary treatment, *Waste water disposal, *Artificial recharge, *Injection wells, *Recharge wells, Florida, Aquifers, Aquifer characteristics, Hydrogeology, Limestones, Dolomite, Karst, Artesian wells, Confined water, Aquicides.
Identifiers: *Waste disposal wells.

Artificial recharge of a carbonaceous saline aquifer of South Florida is used to dispose of treated sanitary waste. The deep open-hole injection well is located immediately south of Miami, Florida. The treated wastewater has a lower specific gravity (approximately 1.025). Mixing will occur at the very beginning of the injection period and thereafter a fresh-water bubble will develop, floating on the saline water and limited above by confining layers. Injection of the fresh-water effluent into the deep artesian aquifer of south Florida will lead to the formation of an enormous fresh-water bubble at the top of the aquifer which would be under normal artesian pressure. Such a volume of water could be used for irrigation or for future water supply when shortage of present fresh water sources would justify cost of reclaiming the stored water. (Knapp-USGS)
W71-12415

BEHAVIOR OF WATER IN A SOUTHWESTERN IMPOUNDMENT,
Oklahoma Univ., Norman. School of Engineering and Environmental Science.
For primary bibliographic entry see Field 02H.
W71-12422

FACTORS AFFECTING WATER QUALITY OF SMALL MOUNTAIN CATCHMENTS,
Swiss Forest Research Inst., Birmensdorf (Switzerland).
For primary bibliographic entry see Field 02K.
W71-12425

A BILL TO CONSOLIDATE WATER QUALITY MANAGEMENT AND POLLUTION CONTROL AUTHORITIES AND FUNCTIONS IN THE ENVIRONMENTAL PROTECTION AGENCY.
For primary bibliographic entry see Field 06E.
W71-12495

A BILL TO AMEND SECTION 12 OF THE FEDERAL WATER POLLUTION CONTROL ACT RELATING TO THE CONTROL OF HAZARDOUS POLLUTING SUBSTANCES.
For primary bibliographic entry see Field 06E.
W71-12498

POLLUTION OF THE OCEAN WATERS OF ITALY: CAUSES, EFFECTS ON THE BIOLOGICAL ENVIRONMENT, CONTROL AND PREVENTION (IN ITALIAN),
Laboratorio Centrale di Idrobiologia, Rome (Italy).
For primary bibliographic entry see Field 05C.
W71-12506

PROHIBITION, PENALTIES, AND REMEDIES FOR THE POLLUTION OF A CITY OR TOWNSHIP'S WATER SUPPLY.
For primary bibliographic entry see Field 06E.
W71-12558

SHORELAND DEVELOPMENT.
For primary bibliographic entry see Field 06E.
W71-12560

DISCLOSURES PERTAINING TO MATTERS INVOLVING THE ENVIRONMENT.
Securities and Exchange Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-12581

PREVENTION AND CONTROL OF OIL SPILLS.

Proceedings of Joint Conference on Prevention and Control of Oil Spills, June 15-17, 1971, Washington, D.C.; American Petroleum Institute Publication, Washington, D.C., 1971. 544 p.

Descriptors: *Water pollution sources, *Water pollution control, *Oil industry, *Oil wastes, Pollutant identification, Analytical techniques, Water quality, Surface waters, Oceans, Water analysis, Ice.
Identifiers: *Oil spills.

This volume contains 65 papers on prevention and control of oil spills that were presented in Washington, D.C. June 15-17, 1971 at a joint conference of the American Petroleum Institute, Environmental Protection Agency, and United States Coast Guard. Topics for the different categories include: Laws and Enforcement; Oil Spill Prevention; Control and Monitoring; Treating Agents; Physical Removal and Containment; Physical-Biological Effects; and Oil Spill Cleanup. (See also W71-12589 thru W71-12594) (Woodard-USGS)
W71-12588

REMOTE SENSING OF OIL SPILLS,
Coast Guard, Washington, D.C. Office of Research and Development.
C. E. Catoe, and F. L. Orthlieb.
In: Proceedings of Joint Conference on Prevention and Control of Oil Spills, June 15-17, 1971, Washington, D.C.; American Petroleum Institute Publication, Washington, D.C., p 71-84, 1971. 17 fig, 6 tab, 3 ref.

Descriptors: *Remote sensing, *Oil wastes, *Water pollution sources, *Water pollution control, *Oil industry, Oceans, Analytical techniques, Aircraft, Instrumentation.
Identifiers: *Oil spills, *Remote sensing (Oil spills).

A prerequisite for the control of coastal oil pollution is the development of surveillance techniques which are capable of monitoring large areas of the ocean surface to detect the presence of oil slicks. The U.S. Coast Guard Office of Research and Development is currently engaged in basic and applied research to determine the feasibility of various remote sensing techniques for the detection and identification of oil slicks. To date, several remote detection techniques have shown promise for the detection and surveillance of oil slicks. Radar and passive microwave techniques appear very promising. Mapping experiments performed in the Chedabucto Bay area of Nova Scotia and in Southern California have resulted in synthetic aperture imagery in which oil slicks are quite evident and well defined. Using passive microwave techniques, it is possible to detect oil slicks on the open ocean. (See also W71-12588) (Woodard-USGS)
W71-12589

IDENTIFICATION OF OIL LEAKS AND SPILLS,
Standard Oil of California, San Francisco.
For primary bibliographic entry see Field 05A.
W71-12590

OIL VERSUS OTHER HAZARDOUS SUBSTANCES,
Environmental Protection Agency, Washington, D.C. Water Quality Office.
C. H. Thompson.
In: Proceedings of Joint Conference on Prevention and Control of Oil Spills, June 15-17, 1971, Washington, D.C.; American Petroleum Institute Publication, Washington, D.C., p 209-212, 1971. 1 fig, 1 tab, 7 ref.

Descriptors: *Water Quality Act, *Water pollution sources, *Oil wastes, *Water pollution control, *Water law, *Oil industry, Chemical properties, Administrative decisions, Water quality, Pollution abatement.
Identifiers: *Water quality laws.

The Water Quality Improvement Act of 1970 requires that pollution by oil and hazardous substances other than oil be regulated by the Federal Government. By satisfying the several provisions of the Law an overlap occurs when dealing with establishing the difference between oil and hazardous substances. To satisfy in part the provisions of section 11 and 12 of the Law, regulations are to be promulgated for oil and hazardous substances. A rationale is presented in this paper which, when combined with the regulations, should allow industry and government to proceed in this area without detailed lists of materials being required. The rationale is based upon a material being petroleum derived or extractable or having defined chemical structure. (See also W71-12588) (Woodard-USGS)
W71-12591

PHYSICAL PROCESSES IN THE SPREAD OF OIL ON A WATER SURFACE,
Massachusetts Inst. of Tech., Cambridge. Fluid Mechanics Lab.
For primary bibliographic entry see Field 05B.
W71-12592

THE BEHAVIOR OF OIL ON WATER DERIVED FROM AIRBORNE INFRARED AND MICROWAVE RADIOMETRIC MEASUREMENTS,
TRW Systems, Houston, Tex.
For primary bibliographic entry see Field 05B.
W71-12593

THE MOVEMENT OF OIL SPILLS,
New York Univ., N.Y., School of Engineering and Science.
For primary bibliographic entry see Field 05B.
W71-12594

PRIMARY PRODUCTION IN RELATION TO THE HYDROLOGICAL REGIME OF A SEA BASIN (EXEMPLIFIED BY THE WHITE SEA),
Moscow State Univ. (USSR).
V. D. Fedorov, and V. A. Semin.
Oceanology, (USSR), Vol 10, No 2, p 242-253, November 1970. 12 p, 5 fig, 4 tab, 7 ref.

Descriptors: *Primary productivity, *Sea water, *Nutrients, Photosynthesis, Water chemistry, Organic matter, Phytoplankton, Ammonia, Phosphorus, Iron, Silica, Regression analysis.
Identifiers: White Sea.

The radiocarbon method was used to study the influence of nitrate and ammonia nitrogen, phosphorus, iron and silicon additions on the phytoplankton primary production of the Karelian coast of the White Sea. The effect produced by each element separately on primary production was studied using regression analysis. A relation was found between the action of biogenous elements on the radiocarbon fixation and the hydrochemical regime of the sea basin observed against the background of changes in the composition of plankton species during a season. This relation may be used to predict the influence exerted by changes in the concentration of any particular element over the whole extent of the region of other interacting factors. The true influence of any factor on the new formation of organic matter in the sea becomes apparent after a time interval necessary for rousing a response in the producing system. (Knapp-USGS)
W71-12638

CRITERIA FOR STATE, LOCAL AND REGIONAL OIL REMOVAL CONTINGENCY PLANS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-12651

URBAN RUNOFF CHARACTERISTICS,
Cincinnati Univ., Ohio. Div. of Water Resources.
Herbert C. Preul, and Constantine Papadakis.
Copy available from GPO Sup Doc as SN-5501-0098, $2.75; microfiche from NTIS as PB-202 865, $0.95. Interim Report for EPA-WQO No 11024 DQV 10/70, 340 p, 161 fig, 67 tab, 37 ref. EPA Research Grant No. 11024 DQU.

Descriptors: *Storm runoff, *Overflow, *Watershed management, *Hydrographs, *Management, Computer models, Sampling, Mathematical models, Water pollution sources, Testing, Sewers, Storm drains, Data collections.

Detailed information on the watershed characteristics and data on runoff quantity and quality have been compiled from a one year study of a combined sewer watershed of approximately 2380 acres in Cincinnati, Ohio. Collection of these data is planned to continue over a several year period. The information collected will be used to test and develop practical storm water management models.
W71-12703

PERMITS FOR DISCHARGES OR DEPOSITS INTO NAVIGABLE WATERS.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-12707

CONTROL OF HAZARDOUS POLLUTING SUBSTANCES.
Coast Guard, Washington, D.C.

Available from the National Technical Information Service as PB-199 193, $3.00 in paper copy, $0.95 IN MICROFICHE. Final report, 20 Oct. 70, 198 p. USSCG-HPS-2.

Descriptors: *Water pollution sources, *Water pollution control, *Environmental effects, *Flotsam, *Legal aspects, Oil wastes, Industrial wastes, Legislation, Aquatic biology, Public health, Hazards.
Identifiers: *Water pollution detection, *Hazardous materials.

Pursuant to Section 12 (g) of the Federal Water Pollution Control Act, as amended by the Water Quality Improvement Act of 1970, an accelerated study was conducted into the methods and masures for controlling hazardous substances to prevent their discharge, the most appropriate measures for enforcement, and recovery of costs if removal is undertaken by the United States. Water, air, and land pollution are inextricably interwoven; however, the study was constrained to consider only the water pollution aspect. Focus was placed on accidental spills and effluent discharges in excess of those authorized. This study supports a report on the need for legislation to impose liability and financial responsibility requirements for the cost of removal of hazardous substances discharged from vessels and onshore and offshore facilities. During

the study contact was made with representatives of the manufacturing industry and of the several surface transportation modes, with Federal and State Officials, with municipal representatives, and with public and private groups. As part of this extensive effort a three-day symposium on hazardous polluting substances was conducted. (An abstract of this symposium is available from NTIS, the accession number being PB-195 342.) In addition, the study includes an extensive bibliography.
W71-12708

DIVISION OF WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W71-12717

DISCHARGE OF OILS INTO WATERS.
For primary bibliographic entry see Field 06E.
W71-12721

WATER SANITATION IN NATIONAL PARKS.
National Park Service, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-12726

WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 06E.
W71-12728

POLLUTION CONTROL AND THE BUDGET,
Illinois Environmental Protection Agency, Springfield.
F. McNaughton.
Environment: Illinois, p. 13-15, January 1971. 3 p.

Descriptors: *Illinois, *Grants, *Water pollution control, *Federal government, State governments, Local governments, Cities, Sewage disposal, Sewage treatment, Sanitary engineering, Environmental sanitation, Treatment facilities, Economics, Political aspects, Capital, Capital supply, Financing, Water pollution, Costs, Cost sharing, Construction costs.

The President is asking Congress for 6 billion dollars for sewage treatment facilities - 2 billion a year for the next 3 years. Under the present federal formula, when state grants reach 25% of the project cost the federal grants will be increased from 30 to as much as 55%. Illinois is ready to provide the 25% because of its recent $750 million bond issue. The amount requested by the President is greatly in excess of previous appropriations, but it is still inadequate to meet the needs of Illinois. At the current rate of federal appropriations, it would be 37 1/2 years before the program provided by the bond issue could be carried out. Construction costs are currently rising 10% or more each year. A delay in providing adequate funds, therefore, greatly increases final costs. Pollution control in Illinois is very important because it involves Lake Michigan, the Ohio River, the Mississippi River, and the Wabash River. (Robinson-Florida)
W71-12731

THE POLLUTION CONTROL BOARD: A FIRST REPORT,
Illinois Environmental Protection Agency, Springfield.
For primary bibliographic entry see Field 06E.
W71-12738

POLLUTION TAXES.
National Wildlife Federation, Washington, D.C.

Conservation News, Vol. 36, No. 16, p. 10, August 15, 1971. 1 p.

Descriptors: *Taxes, *Pollution abatement, *Political aspects, *Federal government, Legal aspects, Air pollution, Water pollution, Sulfur, Financing, Non-structural alternatives, Federal jurisdiction, Industrial wastes, Economics, Treatment facilities, Costs, Pollutants.

Pollution taxes are a tool for fighting environmental pollution and provide economic motivation for polluters to clean up their operations. The economic motivation provided by pollution taxes is unique among pollution control strategies. A coalition of environmental organizations set forth recommendations concerning the tax on sulfur oxide emissions proposed by President Nixon. The coalition added five recommendations designed to strengthen the proposed legislation: (1) that the charge be applied uniformly throughout the nation; (2) that the tax be 20 cents per pound of emitted sulfur; (3) that Congress, rather than an agency, set the level of charges; (4) that the revenue from the tax not be earmarked; and (5) that no subsidies be given to industry but that workers laid off as a result of plant closures be given assistance. The group points out that if the tax is successful it will probably be phased out over a few years since industry will find it more economic to install treatment equipment. Moreover, by making the standards national, there would be no place for polluters to hide. (Horwitz-Florida)
W71-12752

ESTABLISHMENT OF POLLUTION STANDARDS; ASCERTAINMENT OF VOLUME OF WATER; REGULATION OR PROHIBITION OF DISCHARGE OF WASTE; CERTIFICATION; ILLEGAL DISCHARGE OF WASTE; POLLUTION OF WATER; RECOVERY OF CIVIL DAMAGES, ATTORNEY GENERAL TO INSTITUTE ACTION; JURISDICTION IN DISTRICT COURTS,
For primary bibliographic entry see Field 06E.
W71-12758

POLLUTION OF STATE WATER BODIES; DISCHARGE OF UNTREATED WASTES INTO THE MISSISSIPPI RIVER.
For primary bibliographic entry see Field 06E.
W71-12759

MAN AND HIS ENVIRONMENT '68,
Michigan Natural Resources Council, East Lansing.
R. W. Kelley.
Papers and Discussions Presented at 13th Annual Conference, East Lansing, Michigan, September 18-19, 1968. 60 p, 1 illus, 1 append.

Descriptors: *Michigan, *Thermal pollution, *Pesticides, *Industrial wastes, Land use, Land management, Recreation, Non-structural alternatives, Urbanization, Hydroelectric plants, Temperature, Pollution abatement, Water pollution, Water pollution control, Water pollution sources, Water pollution effects, Water pollution treatment, Chemical wastes, Industrial plants, Waste water treatment, Industry, Pulp and paper industry, Pulp wastes, Lumbering, Waste disposal.

Four symposia on the relationship of mankind to the environment are contained in this pamphlet published by the Michigan Natural Resources Council. Water temperature standards are discussed first, followed by a description of the role of industry (primarily electric power) in combating thermal pollution. The effect of thermal pollution on aquatic habitats and the present focus of thermal pollution research efforts are also considered. In the symposium on pesticides, the following topics are considered: (1) the pesticide problem, (2) conservation's concern over pesticide use, (3) pesticide protection and progress, (4) the chemical industry's attitude toward pesticides, and (5) the public health concern over pesticides. The industrial waste problem is described generally, followed by a description of the chemical industry's approach to industrial wastes. Subsurface disposal, the paper industry approach to waste disposal, recreation's relation to industrial waste, and water quality standards are also considered. A final section discusses uncontrolled land use with respect to urban, highway, recreation, agricultural, and forestry problems. (Hart-Florida)
W71-12760

THE POTOMAC--PARTNERS IN PROGRESS--1969-1970.
Interstate Commission on the Potomac River Basin, Washington, D.C.

1969-1970 Report, Washington, D.C., 1971. 37 p, 1 fig, 1 map, 5 illus, 32 photo, 3 tab.

Descriptors: *Interstate rivers, *Interstate compacts, *Interstate commissions, *Water pollution control, Maryland, Virginia, West Virginia, Pennsylvania, Federal government, State governments, Water resources development, Water pollution, Water pollution treatment, Water pollution sources, Water pollution effects, Pollutants, Pollution abatement, Industrial wastes, Municipal wastes, Treatment facilities, Waste treatment, Legislation, Legal aspects, Water quality, Water quality control, Standards.
Identifiers: *Potomac River.

The Interstate Commission on the Potomac River Basin herein describes its progress in the years 1969-70. The organization and operation of the Commission are first explained, and the changes reflected in recent compact amendments are discussed. A proposed Federal-Interstate Potomac Compact is also described. State legislation affecting the compact enacted during 1969-70 is also presented. Following descriptions of recreation areas on the Potomac, the Potomac River Enforcement Conference's activities are delineated. A detailed description is given of municipal waste treatment operations and problems. Furthermore, the Commission's education program for treatment plant operators is discussed, and Industrial pollution is considered. The Commission operates an extensive water quality network, which the booklet describes, along with its research program. Means of controlling floods and maintaining water supply through reservoirs and watersheds are discussed. The primary pollutant of the Potomac River is sediment, and programs for abating it are described. Maryland sewer and water plans are discussed. (Hart-Florida)
W71-12761

PROTECTING THE WORLD ENVIRONMENT IN THE LIGHT OF POPULATION INCREASE.
Executive Office of the President, Office of Science and Technology, Washington, D.C.
For primary bibliographic entry see Field 06G.
W71-12763

INSTITUTIONAL ARRANGEMENTS AND PROGRAMS.
Indiana Department of Natural Resources, Indianapolis, Indiana.
For primary bibliographic entry see Field 06E.
W71-12764

SALT WATER AND WASTE DISPOSAL WELLS: STATE REGULATIONS AND GEOLOGICAL PROBLEMS,
Louisiana Geological Survey, Baton Rouge.
L. W. Hough.
Louisiana Geological Survey, Baton Rouge, La. (rev. October 1968). 13 p, 2 fig, 2 ref.

Descriptors: *Louisiana, *Water conservation, *Saline water intrusion, *Water pollution control, Saline water, Regulation, Pollution abatement, State governments, State jurisdiction, Administration, Administrative agencies, Permits, Standards, Supervisory control (Power), Oil industry, Oil wastes, Oil wells, Water pollution sources, Waste disposal, Deep-well pumping, Water quality.

The Louisiana Department of Conservation has the responsibility of protecting fresh water sands from

contamination by oil, gas, and salt water. The Commissioner of Conservation is given authority to make rules and regulations to: (1) require drilling, casing, and plugging of wells to be done so as to prevent the escape of oil or gas from one stratum to another; (2) prevent the pollution of fresh water supplies by oil gas, or salt water; (3) prevent the intrusion of water into oil or gas strata; and (4) require reasonable bond as security for the performance of the duty to plug each dry or abandoned well. Permits must be secured before disposing of salt water underground. The Department requires that salt water be injected into sand which carries salt water and that no fresh water be displaced thereby. The Board of Health has authority over the disposal of sewage and other waste material. Permits for underground disposal of sewage and industrial wastes must be obtained from both the Board of Health and the Department of Conservation. Approval procedures for all permits are included. (Horwitz-Florida)
W71-12765

E-P-A STEPS UP CONTROL PROGRAM,
W. L. Blaser.
Environment: Illinois, Illinois Environmental Protection Agency, Springfield, Ill., Spring 1971, p 9-16. 8 p, 2 photo.

Descriptors: *Illinois, *Water pollution control, *Administration, *Administrative agencies, Political aspects, Standards, Permits, Public health, Inspection, Pollution abatement, Financing, Treatment facilities, Waste disposal, Water pollution sources, Water supply, Water pollution treatment, Water conservation, Water policy, Regulation.

The Illinois Environmental Protection Agency, with a staff of more than 300 persons throughout the state, endeavors to control and reduce air, water, land and noise pollution, as well as to protect the public water supply. The Agency has been concentrating on: (1) reorganization efforts, (2) developing a program to deal with violators of the Environmental Protection Act, and (3) implementation of the 1970 Anti-Pollution Bond Act. In the area of pollution control enforcement, the division of responsibility between the agency and the attorney general has proven to be an effective combination of the fields of expertise of both arms of the state government. The attorney general acts as prosecutor for the agency. The Agency has concentrated on enforcement proceedings in four major areas: (1) poorly managed trash and garbage dumps, (2) open burning by the railroad and salvage industries, (3) inadequate municipal sewage treatment works, and (4) the asphalt industry. The problems of developing water pollution standards, as well as surveillance through a new electronic system, are also considered. The financial aid to municipalities under the $750 million Anti-Pollution Bond Act is discussed and deemed to be progressing at a satisfactory rate. (Horwitz-Florida)
W71-12766

WATER POLLUTION - 1970, PART 3.
United States Senate Committee on Public Works, Washington, D.C. Subcommittee on Air and Water Pollution.

Hearings-Subcomm. on Air and Water Pollution-Comm. on Public works, U. S. Senate, 91st Cong, 2d Sess, Part 3, p 903-1329, May 26, 27, 28, 1970. 467 p, 65 fig, 71 tab, 1 chart, 135 ref, 3 append.

Descriptors: *Federal government, *Water pollution control, *Phosphates, *Eutrophication, Pollution abatement, Water pollution sources, Water pollution effects, Water quality control, Water pollution, Standards, Chemical wastes, Nutrients, Tertiary treatment, Treatment facilities, Waste treatment, Water pollution treatment, Detergents, Government finance, Great Lakes Region, Legislation, Legal aspects.

In response to increased concern overphosphate water pollution, the Senate Committee on Public Works, Subcommittee on Air and Water Pollution, held hearings on various legislation to ban or control the use of phosphates in various products. Witnesses testified to the major effect of phosphate pollution: eutrophication. Phosphate is an essential nutrient in the eutrophication cycle and contributes significantly to the degradation of lakes and streams. Studies of selected lakes in the Great Lakes Region are included to show the effects of phosphate introduction. Witnesses from the detergent industry denied that phosphate was a major water pollution problem. The argument was made that phosphates are an essential cleaning agent and that washing machines and other home laundering would be seriously affected. It was agreed that an increase in tertiary sewage treatment would eliminate many of the nutrients essential to eutrophication. Testimony was also heard on proposed legislation to reorganize financing of the waste treatment construction program through the creation of a federal lending authority. Conservation groups discussed the need for effluent standards, as opposed to stream standards, to abate pollution. (Smiljanich-Florida)
W71-12767

WATER POLLUTION--1970 PART 4.
Hearings--Subcomm. on Air and Water Pollution--Comm. on Public Works, U.S. Senate, 91st Cong, 2d Sess, p 1381-1610, part 4, Jun 8, 1970. 330 p, 55 fig, 49 tab, 441 ref, 1 append.

Descriptors: *Eutrophication, *Water pollution control, *Phosphates, *Detergents, Chemical wastes, Nutrients, Oxygen sag, Water pollution, Water pollution effects, Water pollution treatment, Water pollution sources, Water quality control, Federal government, Legislation, Domestic wastes, Municipal wastes, Waste treatment, Waste water treatment, Tertiary treatment, Sewage treatment, Organic wastes.

These Senate hearings on twelve bills relating to water pollution control focus on water pollution from arsenic in detergents and eutrophication from phosphates in detergents. Testimony by Dr. Ernest Angino, of the Kansas Geological Survey, voiced concern over arsenic in state waters, pointing out that arsenic is a cumulative poison. Dr. Angino also observed that detergents were not the sole source of arsenic water pollution. Three articles concerning arsenic in detergents and concomitant pollution and public health hazards were introduced into the record. Representatives from Monsanto Chemical Company and FMC Corporation testified on eutrophication from detergents. Both companies took the position that phosphate in detergents were over-emphasized as a cause of eutrophication, since twenty other nutrients also cause eutrophication. Monsanto also related results of tests with sodium nitrilotriacetate (NTA), used as a substitute for phosphates in detergents. Other articles concerning eutrophication are included in the record. (Hart-Florida)
W71-12768

SAFE DRINKING WATER.
For primary bibliographic entry see Field 05F.
W71-12769

WATER QUALITY STANDARDS: INTERSTATE WATERS WABASH RIVER AND TRIBUTARY STREAMS CROSSING INTO INDIANA.
Illinois Sanitary Water Board, Springfield.

Rules and Regulations SWB-9, December, 1968. 10 p, 1 map, 1 tab.

Descriptors: *Illinois, *Standards, *Water quality control, *Regulation, Rivers, Pollution abatement, Administrative agencies, Permits, State governments, State jurisdiction, Water pollution, Water quality, Public health, Water pollution sources, Legal aspects, Waste disposal, Waste water disposal, Water utilization, Adoption of practices, Water pollution control.

The standards of water quality herein established prescribe the qualities or properties of the waters of the State which are necessary for the designated public use or benefit, and which, if violated, shall be considered indicative of a polluted condition subject to abatement. Minimum standards, applicable to all waters, require that water be free from: (1) substances that will settle to form putrescent or otherwise objectionable sludge deposits; (2) floating debris, oil, and other floating materials attributable to municipal, industrial, or other discharges in amounts sufficient to be unsightly or deleterious; (3) materials producing color, odor, or other conditions creating a nuisance; and (4) substances in concentrations toxic or harmful to human, animal, plant, or aquatic life. Specific standards are established to cover the following water uses: public water supply and food processing, aquatic life, recreation, and industrial water supply. Specific criteria are detailed for such factors as: bacteria, dissolved solids, radioactive substances, chemical constituents, dissolved oxygen, pH values, and water temperature. An implementation and enforcement plan is also set forth. (Horwitz-Florida)
W71-12770

WATER POLLUTION CONTROL IN GEORGIA.
Georgia Water Quality Control Board, Atlanta.

Public Information Office, Georgia Water Quality Control Board, Atlanta, Georgia. 7 p, 1 tab.

Descriptors: *Georgia, *Water pollution control, *Waste disposal, *Administrative agencies, Regulation, State governments, Federal government, Local governments, Jurisdiction, Water pollution, Permits, Standards, Supervisory control (Power), Treatment facilities, Water quality control, Water pollution effects, Legal aspects, Financing, Evaluation.

An overall picture of the water pollution problems and the methods used in combating these problems in Georgia is presented in this publication. The Division for Water Quality Control is the operational arm of the Water Quality Control Board. It has an authorized personnel complement of 50 consisting mostly of engineers, biologists, chemists, and marine technologists. The water quality standards and stream classifications of Georgia are both considered. The minimum standard of waste treatment in Georgia is secondary biological treatment or its equivalent for industrial wastes. The construction progress of waste treatment facilities for both municipalities and industry from 1965 to 1969 is evaluated. The use of legal action by the Board to achieve enforcement of pollution control programs is discussed. The Board, however, prefers to rely upon voluntary compliance. This publication also considers interstate enforcement conferences and the status of stream pollution abatement. The major problems hindering effective pollution control are listed as: financial shortages, a need for qualified pollution control plant operators, and obtaining qualified personnel to work for the control agency. (Horwitz-Florida)
W71-12771

THE NATIONAL WATER COMMISSION AND THE WATER RESOURCES COUNCIL,
T. M. Schad, W. D. Maughan, S. L. McFarland, and J. T. Verkler.
American Water Works Association Journal, Vol 63, No 2, p 109-116, February 1971. 8 p, 2 fig, 2 tab, 4 ref.

Descriptors: *Federal government, *Administrative agencies, *Water resources development, *Water Resources Planning Act, Water requirements, Legislation, Administration, Administrative decisions, Water utilization, Water policy, Water resources, Legal aspects, Water law, Water supply, Water sources, Water pollution, Water pollution

control, Water quality, Water quality control, Grants.
Identifiers: National Water Commission, Water Resources Council.

Presented in this article is a joint discussion dealing with the National Water Commission and the Water Resources Council. The first participant attempts to answer questions which have arisen regarding the relationship between the National Water Commission and the Water Resources Council and reveals that there has been little duplication or conflict. The makeup and operations of the Council are the subject of the second participant who also discusses the Council's study of a multiple-objective approach to the evaluation of water-resource programs and projects. The third participant appraises the relative merits of the Council and the Commission and examines their statutory bases. This author feels that the Council has not been successful, and he considers how the Commission might avoid the same problems. Some of the ancillary benefits arising from the work of the Council and the Commission are examined in the last segment of the discussion. This portion of the discussion details the role of water resource development in the environmental movement and explores specific planning and control mechanisms available to meet environmental objectives. (Robinson-Florida)
W71-12772

REPORT TO THE PRESIDENT AND TO THE COUNCIL ON ENVIRONMENTAL QUALITY.
Citizens' Advisory Committee on Environmental Quality, Washington, D.C.

April 1971. 56 p, 16 photo, 2 append.

Descriptors: *Environmental sanitation, *Pollution abatement, *Water pollution control, *Water quality control, Tertiary treatment, Water policy, Treatment facilities, Municipal wastes, Industrial wastes, Standards, Regulation, Oil, Land use, energy, Air pollution, Solid wastes, Federal government, State governments, Legal aspects, Legislation, Financing, Permits, Rivers and Harbors Act.

The Citizens' Advisory Committee on Environmental Quality herein submits a summary report on selected problems of environmental quality, including: (1) land use controls, (2) energy production control, (3) pollution abatement, (4) environmental education and citizen responsibility, and (5) priorities and financing. The Committee commends the increased support for water pollution control. As the fiscal situation permits, a top priority for the nation is comparable attention to federal air and solid waste management programs. With certain limited exceptions, tertiary treatment of all waste water, or some other technological equivalent, should be adopted as the ultimate goal of the water quality program. The technology for processing sewage effluent into drinking water is available. Upgrading treatment to tertiary standards would double capital construction and operating costs, but such treatment is becoming essential in urban areas. It is also important that states be urged to bring their water quality standards up to federal requirements. Permit requirements under the Refuse Act should be amended, and governmental action is requested for the strict regulation of oil tankers. Appendices include background information on the Committee and a guide to citizen participation. (Smiljanich-Florida)
W71-12773

IMCO CIVIL LIABILITIES CONVENTIONS.
United States Senate Committee on Public Works, Washington, D.C. Subcommittee on Air and Water Pollution.

Hearings - Subcomm. on Air and Water Pollution - Comm. on Public Works, U.S. Senate, 91st Cong, 2d Sess, July 21 and 22, 1970. 2 tab, 48 ref, 109 p.

Descriptors: *Federal government, *Legislation, *Pollution abatement, *Oil, Oceans, Remedies, Water pollution, Water quality control, Water pollution sources, Water pollution control, Path of pollutants, Pollutants, Oil wastes, Oil industry, Coasts, Waste disposal, Treaties, International law, International waters, Water pollution effects, Legal aspects, Ships, Fish.

Hearings were held by the Senate Committee on Public Works, Subcommittee on Air and Water Pollution, to discuss the relationship between the Brussels Convention on Civil Liability for Oil Pollution and recently enacted oil pollution legislation. An attempt was made to determine whether the Treaty or a new statute provides greater protection against an oil pollution incident. The hearings also attempted to determine whether the Treaty or the legislation provides greater protection for beach owners and other dependant upon the coast. Witnesses from various agencies and organizations testified that if the Treaty were ratified inconsistent provisions in the legislation would be superceded. The Treaty and legislation differ as to: (1) vessels covered, (2) limits of liability, (3) remedies for payment of claims, and (4) nature of liability. One witness recommended that the Senate wait one year before advising ratification in order to allow the Convention to pass a more stringent treaty. A major problem discussed was the applicability of the Treaty to damages to fishing resources in contiguous zones. (Smiljanich-Florida)
W71-12774

OIL POLLUTION OF THE MARINE ENVIRONMENT - A LEGAL BIBLIOGRAPHY.
United States Senate Committee on Public Works, Washington, D.C.

Committee on Public Works, US Senate, 92d Cong, 1st Sess (Comm print January 1971). 93 p, 1115 ref.

Descriptors: *Bibliographies, *Oceans, *Water pollution sources, Oil wastes, Law of the sea, Environmental sanitation, Water pollution, Oily water, International law, International waters, Water law, Legal aspects, Treaties, Legislation, Regulation, Oil industry, Federal government, State governments, Administrative agencies, Environment, Ecology, Publications, Technical writing, Oil, Data collections.

A list of the following types of sources dealing with oil pollution of the marine environment is presented in this legal bibliography: (1) articles, (2) books, (3) United Nations documents, (4) documents of other international organizations, (5) federal statutes, (6) congressional committee hearings and reports, (7) United States executive department publications and federal regulations, (8) United States administrative agency documents and publications, (9) bilateral and multilateral treaties, (10) foreign statutes and official decisions, (11) California statutes and official decisions, (12) statutes and governmental acts from selected states, and (13) selected bibliographies. (Robinson-Florida)
W71-12775

OCEAN WASTE DISPOSAL.
United States Senate Committee on Commerce, Washington, D.C. Subcommittee on Oceans and Atmosphere.
For primary bibliographic entry see Field 05E.
W71-12776

WATER QUALITY STANDARDS.

Alaska Admin Code, ch 70, secs 70.010 thru 70.090. 5 p, 1 tab.

Descriptors: *Alaska, *Standards, *Waste disposal, *Water quality control, Sewage, Regulation, Water law, Legal aspects, State governments, Industrial wastes, Water pollution control, Water supply, Recreation, Industrial water, Aquiculture, Fish farming, Turbidity, Color, Toxicity, Radioactivity effects, Coliforms, Dissolved oxygen, Hydrogen ion concentration, Temperature, Sediments, Aesthetics, Adoption of practices.

Water quality standards herein prescribed apply to all waters of the state. Where waters have more than one use, they shall be classified according to the highest use classification possible. Where a tributary water which receives sewage or industrial waste or which has a lower use or classification than that of the water into which it flows and the tributary water affects the higher use or classification, the higher use or classification shall be maintained. These standards relate to conditions created by the discharge of sewage, industrial wastes, or other pollutions. Water use categories include the following: (1) water supply without prior treatment, (2) water supply with adequate treatment, (3) recreational, (4) fish propagation, (5) shellfish growth and propagation, (6) agricultural, and (7) industrial. Water quality parameters are based upon the following factors: (1) coliform count, (2) dissolved oxygen, (3) pH, (4) turbidity, (5) temperature, (6) dissolved inorganic substances, (7) residues, (8) sediments, (9) toxic and other deleterious substances, (10) color, (11) radioactivity, and (12) aesthetic considerations. Secondary treatment is required for all industrial and municipal waste unless approved engineering studies show that water quality standards can be met through primary treatment. (Johnson-Florida)
W71-12777

PREVENTION OF INDUSTRIAL WASTE POLLUTION.
Alaska Administrative Code ch 7, secs 500 thru 517. 9 p.

Descriptors: *Alaska, *Waste disposal, *Industrial wastes, *Separation techniques, Regulation, Administrative agencies, Water law, Legal aspects, State governments, Pollutant identification, Water pollution control, Water pollution sources, Cleaning, Wood wastes, Pulp wastes, Oil wastes, Waste treatment, Sanitary engineering, Waste storage, Treatment facilities, Ultimate disposal, Adoption of practices.

Most of the pollution from industrial wastes can be eliminated by careful operations and comparatively inexpensive waste prevention measures. Waste saving measures have resulted in profit to certain industries, but the true value of these measures is in the reduction of the pollution load on public waters or on the operation load applied to municipal sewage treatment facilities. Regulations herein set forth impose minimum requirements on specific industries that will promote waste prevention. The following industries are encompassed by these regulations: packing plants, milk product plants, canneries, breweries, saw mills, oil processing facilities, tanneries, coal and gravel washeries, shipping, oil transportation, the metal industry, and pulp and paper mills. Specific requirements for each industry require such techniques as cleaning without the use of water and the use of screens and other measures to collect wastes. Waste materials resulting from such waste prevention measures must be disposed of in such a manner as to insure that they will not, either directly or indirectly, enter any natural waters. Specific waste standards are set forth. Any person willfully violating any order of the Commissioner of Health and Welfare shall be guilty of a misdemeanor and subject to a fine of not more than $500 and imprisonment for not more than thirty days. (Johnson-Florida)
W71-12778

ADDITIONAL COMMENTS OF SIERRA CLUB ON PROPOSED REGULATIONS BY THE CORPS OF ENGINEERS FOR DISCHARGE OR DEPOSIT INTO NAVIGABLE WATERS.
Sierra Club, San Francisco, Calif.

Sierra Club Legal Committee, San Francisco, California, February 26, 1971. 22 p.

Descriptors: *Regulation, *Evaluation, *Navigable waters, *Water quality control, Waste water (Pollution), Federal government, Administrative agencies, Water pollution, Water quality, Water policy, Standards, Effluents, Industrial wastes, Waste water disposal, Water pollution sources, Waste disposal, Administrative decisions, Public rights, Rivers and Harbors Act, Water pollution control.

The Sierra Club, a nationwide conservation organization, requests that hearings be held and the Corps of Engineers publish a second draft of proposed regulations governing discharges or deposits into navigable waters, open to public comment, before adopting final regulations. The Sierra Club feels the proposed regulations may be used to insulate industry from lawsuits and fines. The Club does not feel that the criteria for granting permits should depend on state water quality standards. State standards have not been effective. The right of the federal government to upgrade water quality and adopt federal effluent standards should be made explicit. Concern is also expressed at the fact that the proposed rules do not make adequate provision for a continuous program of: up-grading plant effluents, monitoring, reporting, or enforcement. The present regulations are also inadequateraspecting public hearings and participation. Detailed comments are set forth on individual subsections of the proposed regulations. (Robinson-Florida)
W71-12779

DEPOSIT OF MOTOR VEHICLE BODIES AND ACCESSORIES INTO THE WATERS OF THE STATE.
Oregon Administrative Rules, ch 340, secs 46-005 thru 46-035 (1970).

Descriptors: *Oregon, *Water pollution control, *Land reclamation, *Erosion control, Regulation, Administrative agencies, Permits, Land forming, Riprap, Erosion, State governments, Land management, Land development, Soil erosion, Soil conservation, Reclamation, Pollutants, Oil, Oil wastes, Pollution abatement, Water pollution, Rivers, Streams, Federal government, Local governments, Legal aspects.

The Oregon Department of Environmental Quality has prescribed rules for depositing motor vehicles and accessories into state waters in order to promote beneficial use of the vehicles and prevent deleterious environmental effects. The only approved beneficial uses of motor vehicle deposits are for land reclamation projects and erosion control projects. A written permit must be secured from the Department before deposit of any motor vehicles into state waters. The permit application must contain: (1) the applicant's name and address; (2) the purpose and necessity of the project; (3) term of the project; (4) location and name of waters; (5) time schedule, method, and program of deposits; and (6) complete engineering plans, prepared by a registered engineer. The motor vehicle bodies and parts must be drained of all petroleum products, chemicals, or other potential pollutants. All glass and windows must be removed. The bodies and parts must be completely covered and secured by concrete or rock riprap. The engineering plan shall consider incorporation of natural surroundings as part of the design. The regulations do not supersede other applicable law, and deposit of vehicles without a permit is a criminal offense. (Hart-Florida)
W71-12780

AN ACT TO PROTECT THE NATURAL ENVIRONMENT.
Bill 94, 4th Session, 28th Legislature, Ontario, Canada, 20 Elizabeth II, 1971. 36 p.

Descriptors: *Environment, *Foreign countries, *Pollution abatement, *Administrative agencies, Water pollution, Water pollution control, Water quality, Water quality control, Regulation, Standards, Air pollution, Permits, Sewage, Sewage disposal, Water pollution treatment, Treatment facilities, Pesticides, Herbicides, Public health, Legislation.
Identifiers: *Ontario, Canada.

To protect and conserve the natural environment, this proposed Environmental Protection Act for the province of Ontario, Canada, provides comprehensive powers for pollution abatement and control agencies. The Act would generally prohibit all non-agricultural waste discharges without a permit, and requires reporting of all contaminating discharges. Emission control devices are required for motor vehicles. Impairing water quality without a permit is prohibited. Certificates of approval are required for waste management facilities; any waste disposal site, however, must also satisfy the bylaws of the municipality where it is located. Use of herbicides and pesticides without a permit or license is prohibited; stop orders may be issued to prevent harmful use of herbicides and pesticides. Certificates of approval are also required for all private sewage disposal systems, and repair and cleaning of private systems is prohibited without a license. Provisions also exist for: (1) control of littering; (2) control orders and stop orders; (3) an appeal board; (4) provincial officers; (5) an environmental council; and (6) other miscellaneous provisions, including comprehensive authority for the Lieutenant Governor to make regulations relating to all parts of the Act. (Hart-Florida)
W71-12781

WATER QUALITY STANDARDS.
New Mexico Water Quality Control Commission, Sante Fe.

June 1967, as amended, March 1971. 86 p.

Descriptors: *New Mexico, *Water quality control, *Standards, *Regulation, Water pollution sources, Water pollution, Water pollution control, Water quality, Water pollution effects, Administrative agencies, Pollutants, Pollution abatement, Waste water disposal, Waste water (Pollution), Waste water treatment, Treatment facilities, Thermal pollution, Turbidity, Hydrogen ion concentration, Legal aspects, Warm-water fish, Recreation, River systems, Water utilization.

In order to protect the quality of the surface waters of New Mexico, water quality standards are herein prescribed for the five major river systems in New Mexico. To promote these goals, the New Mexico Water Quality Control Commission will investigate all instances of pollution, and will take appropriate action to abate the pollution at its source to the maximum degree practicable with available technology. The reasonable degradation of water quality resulting from beneficial use shall be allowed. Conventional waste-water treatment and disposal techniques can prevent most forms of pollution and help promote the water quality standards. General standards set forth for each river system include minimum requirements for: (1) order; (2) floating solids, oil and grease; (3) pH; (4) turbidity; (5) color; (6) bottom deposits; (7) toxic substances; and (8) radionuclides. Special standards are prescribed for various rivers within each river system including specific criteria for: (1) temperature, (2) biochemical oxygen demand and dissolved oxygen, and (3) fecal coliform bacteria. The special standards vary according to the various water uses such as trout-producing waters, waters producing warm-water fish, and waters used for body contact sports. (Smiljanich-Florida)
W71-12782

THE RESTORATION OF BEACHES CONTAMINATED BY OIL IN CHEDABUCTO BAY, NOVA SCOTIA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
E. H. Owens.
Canada Department of Energy, Mines and Resources Marine Sciences Branch Manuscript Report Series, No 19, 1971. 75 p, 11 fig, 18 photo, 2 tab, 30 ref.

Descriptors: *Water pollution control, *Water quality control, *Oil wastes, *Beaches, *Deposition (Sediments), Oil industry, Ships, Littoral drift, Sands, Beach erosion, Shores, Methodology.
Identifiers: *Oil spills (Beaches), *Chedabucto Bay (Nova Scotia).

Following the wreck of the 'Arrow' in Chedabucto Bay, Nova Scotia, more than 150 miles of shoreline were polluted with Bunker C oil. A beach restoration program was established which involved 30 miles of coastline. The beaches of this region vary from low-energy marsh to complex shingle spit systems, and areas of eroding rock and till deposits. Only a few miles of beach are made up of sand-size material. The contaminated sand beaches were cleaned relatively easily but although various manual and mechanical methods were implemented, no effective or efficient method of removing oil from shingle beaches was found. Oil on active shingle beaches was often buried up to a depth of 5 feet with clean and contaminated sediments thoroughly mixed by wave action. The amount of oil in these sediments was as low as 10 ppm and restoration of this type of shore involved the removal of large volumes of beach material. Where oil remained as a surface layer on the beach, a front-end loader proved to be effective in removing the contaminated layer. (Woodard-USGS)
W71-12802

OIL POLLUTION.
Environmental Protection Agency, Edison, N.J. Water Quality Lab.

Environmental Protection Agency, Edison Water Quality Lab Oil Pollution Research Newsletter, Vol 14, July 1971. 14 p.

Descriptors: *Water pollution sources, *Oily water, *Water pollution control, Oil industry, Water pollution treatment, Ships, Pipelines.
Identifiers: *Oil spills, *Water pollution (Oil).

The growing prominence of Hazardous Materials Research activities in the past several months warrants that this subject matter be treated in a separate Newsletter. Accordingly, as reflected in the new title of this publication, the scope of this volume and all volumes to follow will be devoted only to the oil pollution program. The previous title was 'Vessel Pollution Control Research Newsletter'. Included in the current report is a summary of oil spill incidents described under the following topics: Major oil Spills, Volume Spilled, Source of Spills, Spill Material, Cause of Spills, Experimental Oil-Water Separator Test Installation Completed, Status of Dispersant Tests, and Dispersant Toxicity. A bibliography of recent related publications is included. (Woodard-USGS)
W71-12836

WATER POLLUTION CONTROL (STATE GRANTS AND INDEBTEDNESS FOR WATER POLLUTION CONTROL PROJECTS),
For primary bibliographic entry see Field 06E.
W71-12859

PARISH PURPOSES; MUNICIPAL PURPOSES (POWER TO INCUR INDEBTEDNESS TO CONSTRUCT POLLUTION CONTROL AND OTHER FACILITIES).
For primary bibliographic entry see Field 06E.
W71-12861

NUTRITIONAL POLLUTION BEGS FOR A SOLUTION,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 05C.
W71-12862

DRAINAGE OF OIL, SALT WATER, ETC. INTO NATURAL DRAIN PROHIBITED; PENALTIES.
For primary bibliographic entry see Field 06E.
W71-12863

UNLAWFUL REFUSE DUMPING - EXCEPTIONS, PENALTIES, AND ENFORCEMENT.

Indiana Stat Ann secs 10-2605b (1970 Supp).

Descriptors: *Indiana, *Waste disposal, *Water pollution sources, *Water quality control, Water pollution control, Legislation, Legal aspects, Water law, Water pollution, Water quality, Wastes, Water resources, Water policy, Waste water disposal, Lakes, Streams, Recreation wastes, Garbage dumps, Landfills, Domestic wastes, Industrial wastes.

It is unlawful for any person to put or leave refuse in or adjacent to any public highway, state park, recreation area, lake, or stream, except in a proper container or in an approved land fill operation. Discharges covered by a pollution abatement program approved by the Indiana Stream Pollution Control Board are also excepted. These provisions do not apply to any body of water created for the purpose of industrial waste disposal. Upon conviction, violators may be fined up to $100 and imprisoned for not more than 30 days. Definitions of refuse and person are set forth. All peace officers of the state shall enforce the provisions of the Act. Conservation officers of the Department of Natural Resources shall have all the powers of peace officers for the purposes of this Act. (Robinson-Florida)
W71-12865

DELAWARE'S NEW 'KEEP OUT' SIGN.
For primary bibliographic entry see Field 06E.
W71-12869

GLOBAL POLLUTION - 1: THE CHINESE INFLUENCE,
For primary bibliographic entry see Field 06E.
W71-12875

GLOBAL POLLUTION - III: U. N. AS POLICEMAN,
For primary bibliographic entry see Field 06E.
W71-12879

TAXING U. S. POLLUTERS,
For primary bibliographic entry see Field 06E.
W71-12893

CRYSTAL WATERS ACT.
For primary bibliographic entry see Field 06E.
W71-12906

MARINE TOILETS.
For primary bibliographic entry see Field 06E.
W71-12915

WATER POLLUTION.
For primary bibliographic entry see Field 06E.
W71-12919

NADER ON WATER.
For primary bibliographic entry see Field 06E.
W71-12920

BIOLOGY AND WATER POLLUTION CONTROL,
Charles E. Warren.
434 p. Illus. W. B. Saunders Co.: Philadelphia, Pa., 1971. Pr. $11.00.
Identifiers: Aquatic, Biological, Biology, Book, Chemicals, Control, Ecology, Legislation, Organisms, Pollution, Population, Toxic, Water.

The biology relevant to water pollution control is explained. Each chapter provides an informative introduction to its topic, beginning with an historical background of water distribution, waste collection and treatment, laws and regulations and recent trends. The meaning of pollution is discussed along with water quality standards and water use classification. Biological approaches to water pollution problems are also analyzed. Conditions of life in the aquatic environment are covered: the physical and chemical environment and kinds of pollution (organic, oxygen depletion, solids, suspended and dissolved, temperature, toxic and radioactive substances). Next considered are the significance of morphological and physiological changes and adaptations in aquatic organisms. The ecology of the individual organisms as a unit of study covers development, bioenergetics, behavior, tolerance of lethal conditions and application of toxicity bioassay results. Population ecology is studied, following by discussions of community ecology: energy and material transfer, biological indices and biological waste treatment. The concluding section discusses ecological change and the roles of water pollution biologists in the methods of its study.--Copyright 1971, Biological Abstracts, Inc.
W71-12921

PHOSPHATES DOWN BUT FAR FROM OUT.

Business Week, July 3, 1971, p 21. 1 p, 1 photo.

Descriptors: *Administrative decisions, *Water pollution sources, *Phosphates, *Detergents, Federal government, State governments, Regulation, Administrative agencies, Legal aspects, Water pollution, Water pollution control, Water quality, Water quality control, Pollution abatement, Chemical wastes, Domestic wastes, Political aspects.

Detergent makers have convinced some government leaders that removal of phosphates from detergents is not the cure-all to water-pollution problems. The industry has argued that better sewage treatment is required, and some of the non-phosphate detergents have been found to be health hazards. The Federal Trade Commission is expected to rule soon on the required labeling of phosphate detergents as pollutants. Many feel that a government sellout will be the result. In any event, it is clear that for political reasons, if nothing else, phosphates will be removed as soon as a suitable substitute comes along. Many states and municipalities already have antiphosphate legislation. Previously banned nitrilotiacetic acid may be allowed in the future. Meanwhile, earnings of detergent companies seem barely affected by the controversy. (Robinson-Florida)
W71-12922

MINSHALL V CORPORATION COMMISSION (VALIDITY OF COMMISSION'S ORDER TO FORMER OPERATOR TO REPAIR LEAKING OIL WELL).
For primary bibliographic entry see Field 06E.
W71-12923

PLUGGING OIL AND GAS WELLS.
For primary bibliographic entry see Field 06E.
W71-12925

MUNICIPAL AUTHORITY OVER WATERCOURSES AND SEWERS.
For primary bibliographic entry see Field 06E.
W71-12927

CLEAN STREAMS LAW--INDUSTRIAL WASTES.
For primary bibliographic entry see Field 06E.
W71-12952

CLEAN STREAMS LAW--OTHER POLLUTIONS AND POTENTIAL POLLUTION.
For primary bibliographic entry see Field 06E.
W71-12953

CLEAN STREAMS LAW--PROCEDURE AND ENFORCEMENT.
For primary bibliographic entry see Field 06E.
W71-12954

JACKSON PARISH WATERSHED DISTRICT.
For primary bibliographic entry see Field 06E.
W71-12957

ADVANCES IN MARINE BIOLOGY, VOL. 8,
For primary bibliographic entry see Field 02L.
W71-12962

AN ORDINANCE AMENDING ORDINANCE 1971-1 PROHIBITING SALE AND DISTRIBUTION OF ANY DETERGENT CONTAINING PHOSPHORUS IN EXCESS OF .01 PERCENT, AFTER DECEMBER 31, 1972.
For primary bibliographic entry see Field 06E.
W71-12984

INGRAM V CITY OF GRIDLEY (AWARD OF DAMAGES TO DAIRY FARMER FOR POLLUTION NUISANCE).
For primary bibliographic entry see Field 06E.
W71-12997

ROCK ISLAND OIL AND REFINING CO. V HUTCHINSON (LIABILITY OF OIL COMPANY FOR POLLUTING CREEK AND CAUSING MORTALITY OF CATTLE).
For primary bibliographic entry see Field 06E.
W71-12999

PENNSYLVANIA SOLID WASTE MANAGEMENT ACT.
For primary bibliographic entry see Field 06E.
W71-13005

CLEAN STREAMS LAW--GENERAL PROVISIONS AND PUBLIC POLICY.
For primary bibliographic entry see Field 06E.
W71-13012

CLEAN STREAMS LAW--SEWAGE POLLUTION.
For primary bibliographic entry see Field 06E.
W71-13013

SUMMARY OF LAWS AND REGULATIONS GOVERNING SPILLS AND DISCHARGES OF OIL,
Texaco, In., New York.
William K. Tell, Jr.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971, p. 3-11.

Descriptors: *Legislation, *Oil wastes, *Water pollution control, *Federal Government, *Local governments, Water pollution sources.
Identifiers: Oil spills, Oil discharges.

The past several years have seen a veritable explosion of environmental laws and regulations at all levels, federal, state and local. In many instances the overall law in the area has not evolved in an orderly manner. Legislatures, under heavy pressures to enact forceful measures to enhance the environment, have often acted precipitously without insuring that the total fabric of laws and regulations between state and federal and local governments was coordinated, consistent and non-duplicative. In certain instances earlier laws not specifically tailored to today's environmental problems have been stretched by the courts to apply to polluters. Additional confusion has been created by the large number of enforcement agencies which have been brought into the picture at all levels. The paper at-

tempts to summarize the current state of the law applicable to oil discharges. (See also W71-12588) (Misra-PAI)
W71-13036

OIL POLLUTION CONTROL LEGISLATION AND THE WATER QUALITY IMPROVEMENT ACT OF 1970, THE FEDERAL VIEWPOINT,
Environmental Protection Agency, Washington, D.C. Water Quality Office.
K. E. Biglane, and R. H. Wyer.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 11-17.

Descriptors: *Legislation, *Federal government, *Water Quality Act, *Water pollution control, Oily water, Oil wastes, Water pollution sources.
Identifiers: *Water Quality Improvement Act 1970, Oil spills, Removal, Prevention, Enforcement.

The Water Quality Improvement Act of 1970 was enacted and signed into law on April 3, 1970. This act provides the mechanism for strong Federal actions relating to oil removal, prevention and enforcement. This paper discusses the most significant provisions of the Act and describes the Federal point of view relating to key provisions. Emphasis is placed on the rational behind the designation of a harmful quality of oil, the impact of the notification requirement, adequacy of oil removal procedures, prevention of spills, and enforcement provisions. (See also W71-12588) (Misra-PAI)
W71-13037

NATIONAL CONTINGENCY PLANNING,
Coast Guard, Washington, D.C. Law Enforcement Div.
Daniel B. Charter, Jr.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 17-27.

Descriptors: *Water pollution control, *Oil wastes, *Planning, *Cleaning, Federal government, Local governments.
Identifiers: *Oil spills, *Contingency planning, The Water Quality Improvement Act of 1970.

World production and transportation of petroleum products have reached such magnitudes that the United States must be prepared to cope with a massive pollution disaster near its coast. The problems of advance planning for clean up of oil spills have been recognized for many years but received little active interest before the Torrey Canyon disaster in 1967. Following that incident the United States began developing national and regional oil spill contingency plans. The Water Quality Improvement Act of 1970 spurred additional efforts, resulting in publication of a comprehensive national plan and completion of detailed regional plans. These plans created national and regional response teams and established responsibilities and procedures for responding to spills of oil and hazardous materials in U.S. waters with appropriate cleanup and control measures. The need for international contingency planning has been recognized during the past year, and some work has begun in this area. (See also W71-12588) (Misra-PAI)
W71-13038

INTERNATIONAL ACTIVITY REGARDING SHIPBOARD OIL POLLUTION CONTROL,
Coast Guard, Washington, D.C.
R. I. Price.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 27-42.

Descriptors: *International commissions, *United Nations, *International law, *Water pollution control, *Ships, *Oil wastes, Waste discharge, International waters.
Identifiers: Conventions for Prevention of Pollution of the Sea by Oil, IMCO.

The international activity over the past 50 years directed against oil pollution has been outlined. The first significant effort in this direction was the 1954 Convention for Prevention of Pollution of the Sea by Oil. The convention set up zones in which it was prohibited to discharge oil or any objectionable oily mixture and instituted an oil record book to be kept by each ship on the use and handling of oil on board. It also placed direct obligation on the governments to furnish adequate oil disposal facilities in their ports. The 1962 conference re-examined these regulations and wrote amendments. The creation in 1959 of the Intergovernmental Maritime Consultative Organization (IMCO), a specialized agency of the UN, provided a forum for continuing exchange among the world's maritime safety administrations. The activities and accomplishments of the IMCO have been reviewed. (See also W71-12588) (Misra-PAI)
W71-13039

THE OIL POLLUTION PROBLEM FROM THE VIEWPOINT OF MARINE INSURANCE,
Haight, Gardner, Poor and Havens.
Gordon W. Paulsen.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 43-48.

Descriptors: *Water pollution control, *Oil, *Oily water, *Cleaning, *Insurance, Damages, Compensation, Legislation, Legal aspects.
Identifiers: Oil spills, Clean-up costs, Liability, Oil tankers, Water Quality Improvement Act 1970.

Ever since the grounding of Torrey Canyon there has been considerable legislative activity with respect to liability for oil pollution from vessels. These efforts have taken place at an international level (through IMCO), national levels and at local levels. The Water Quality Improvement Act of 1970 changed the basis for liability of vessel owners to the United States Government from negligence to absolute liability. Despite the general unhappiness of the maritime community with this aspect of the Act it has been found that the liability imposed by the statute could be insured and the evidence of financial responsibility to meet the liabilities imposed by the statute has been furnished to the Federal Maritime Commission. However, the cost and inconvenience to the industry and the U.S. Government of administering the financial responsibility sections has been immense. (See also W71-12588) (Misra-PAI)
W71-13040

SHOULD FINANCIAL LIMITATIONS UPON LIABILITY BE APPLIED TO OIL SPILL REMOVAL AND DAMAGE,
Coast Guard, Washington, D.C. Law Div.
C. R. Halberg.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 49-52.

Descriptors: *Water pollution control, *Oil, *Damages, *Compensation, Water pollution sources, Insurance, International law, Legal aspects.
Identifiers: Oil spills, Liability, Financial limitations.

While several bodies, including the Congress and the 1969 Brussels International Conference on Marine Pollution Damages have concluded that there should be, at least in certain cases, a financial limitation upon liability for damages resulting from oil spills, the issue is far from dead. The question is raised as to whether financial limitation schemes are the best solution to the problem of cost distribution with regard to damage caused by oil. (See also W71-12588) (Misra-PAI)
W71-13041

THE MAINE LAW - A PRECURSOR FOR THE OIL TERMINALING STATES,
Maine Environmental Improvement Commission, Augusta.
William R. Adams.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 53-55.

Descriptors: *Maine, *Legislation, *Water pollution control, *Oil, Oily water, Legal aspects.
Identifiers: *Maine Oil Discharge Prevention and Pollution Control Act.

The provisions of the Maine Oil Discharge Prevention and Pollution Control Act have been outlined. Comprehensive oil discharge prevention regulations and safety requirements for the oil handling facilities of Maine have been drafted and adopted. These regulations delineate safe transfer procedures and require taking of samples and periodic inspection of the vessel while transferring cargo. (See also W71-12588) (Misra-PAI)
W71-13042

STATE JURISDICTION OVER OIL SPILLS IN A FEDERAL SYSTEM,
Rhode Island Univ., Kingston. Dept. of Political Science.
Daniel Wilkes.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 57-67, 3 tab.

Descriptors: *Legislation, *Federal Government, *State governments, *Oil wastes, *Jurisdiction, Water pollution control, Oily water.
Identifiers: Oil spills, Overlapping jurisdictions.

A comparison of the bases for state and federal jurisdictions, in the light of Canadian Arctic, Florida, Maine, and Federal Water Pollution Control Acts has been presented and the problem of overlapping jurisdictions examined. The paper suggests several areas in which the overlaps should be kept and some key ways in which they may be more rationally related, especially in preventive measures and contingency planning. (See also W71-12588) (Misra-PAI)
W71-13043

METHODS AND PROCEDURES FOR PREVENTING OIL POLLUTION FROM ONSHORE AND OFFSHORE FACILITIES,
Environmental Protection Agency, Washington, D.C. Water Quality Office.
R. D. Kaiser, and H. D. Van Cleave.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 85-89, 9 ref.

Descriptors: *Water pollution control, *Oil wells, *Offshore platforms, *Oil fields, Drilling, Oily water.
Identifiers: Safety devices.

A summary is presented of current pollution prevention practices in the production and development of oil and associated appurtenances both onshore and offshore and possible future developments of prevention technology. The role of design criteria, personnel operating procedures, and human error in oil spill prevention are discussed, and future practices postulated. The discussion of the onshore activity focuses on the Colorado River Basin, where extensive field work was done to study the potential pollution problems.

The discussion of offshore facilities aims at a review of the present safety devices and procedures for controlling well flow. (See also W71-12588) (Misra-PAI)
W71-13044

EMBROILED IN OIL,
Environmental Protection Agency, Washington, D.C. Div. of Applied Science and Technology.
Harold Bernard.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 91-96, 3 ref, 2 fig.

Descriptors: *Oil wastes, *Reclamation, *Waste disposal, *Oil wastes, Fuels, Economics, Pollution abatement.
Identifiers: Recycling, Re-refining.

Current methods for handling waste oils, such as automotive crankcase oils, dispose of about 0.5 billion gallons per year directly to the environment. Burning tests using the waste oils for fuel oil produced mixed results. Some tests indicated a 3:1 dilution ratio could provide adequate results; other tests indicated coking of fire tubes and clogging of burner nozzles. A novel refining flow sheet which uses vacuum distillation without clay treatment or chemicals to produce a No. 2 and No. 4 fuel oil is presented. The process is believed to have potential for about 85-90% yield without producing any solid or liquid pollution. (See also W71-12588) (Misra-PAI)
W71-13045

PREVENTION OF MARINE POLLUTION THROUGH UNDERSTANDING,
Marine Advisory and Associated Services.
Paul H. Hammer.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 97-101.

Descriptors: *Waste pollution control, *Water pollution sources, *Ships, *Training, *Programs, Oil wastes, Waste disposal.
Identifiers: Shipboard Pollution Control Indoctrination and Training Program.

The most effective approach to immediate reduction of marine pollution is upgrading of the knowledge and operating practices of personnel directly involved in activities having pollution potential. The author has developed, and is currently conducting, a Shipboard Pollution Control Indoctrination and Training Program. The program, presented on-board during passage, covers all aspects of ship operation at sea and in port which have pollution potential, and aims at better overall pollution control posture of the vessel. The paper outlines the main features of this program. (See also W71-12588) (Misra-PAI)
W71-13046

DEVELOPMENT OF TANK VESSEL OVERFILL ALARM INSTRUMENTS,
Shell Development Co., Emeryville, Calif.
Donald J. Leonard.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 103-108, 1 fig.

Descriptors: *Water pollution control, Ships, Transfer, Oil wastes, *Application equipment, Gages.
Identifiers: Oil tankers, Transfer safety devices.

About two-thirds of the oil spill incidents each year occur in port and harbor areas during routine petroleum transfer. Mostly these spills are the result of personnel errors rather than the equipment failure. A number of devices for prevention of spills due to tank overfilling during tank vessel loading have been described in this paper and the results of initial trials presented. The instruments, made for Shell, are inserted into the tanks through tank-top ullage holes and sound an alarm when the product reaches a level where a spill is imminent. Complete instrument specifications have been presented. (See also W71-12588) (Misra-PAI)
W71-13047

USE OF GRAVITY TYPE OIL SEPARATOR FOR TANKER OPERATIONS,
Cities Service Tankers Corp., Tulsa, Okla.
W. H. Lockwood, and R. O. Norris.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 109-117, 6 fig, 8 tab.

Descriptors: *Oily water, *Separation techniques, *Ships, *Reclamation, Cleaning, Water pollution control.
Identifiers: Tanker operations, Gravity separator.

The need to control the oil content in ballast and tank cleaning discharges to meet increasingly stringent seawater pollution standards has led to the development of a gravity type separator capable of handling up to 300 tons/hour of oily ballast water. These separators enable the tanker operator to clean tanks and process oily ballast with an oil content of up to 100% without fear of contamination of the seas. This continuous and automatic operation is unaffected by normal movements. The recovered oil is available for burning as fuel aboard ship, 'load-on-top' or disposal ashore. Separators of this type have been in use on three 70,000 DWT ships for periods of one to three years. On typical voyages a ship of this size can recover enough slop oil to provide one day or more of bunkers if the ship is equipped to burn the recovered oil. Data from several typical ballast voyages using the separator have been presented. (See also W71-12588) (Misra-PAI)
W71-13048

BALLAST WATER TREATMENT: A MAJOR UNDERTAKING,
State of Alaska. Dept. of Health and Welfare, Juneau.
Jonathan W. Scribner.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 125-132, 4 fig, 8 ref.

Descriptors: *Alaska, *Oil industry, *Oily water, *Harbors, *Treatment facilities, *Waste water treatment, Separation techniques, Fisheries, Balance of nature.
Identifiers: Port Valdez, Oil transportation, Ballast water.

Port Valdez is an important fishery resource area located at the proposed terminus of a 48 inch diameter, 800 mile crude oil pipeline system. This terminus facility will provide for the transfer of crude oil to large oil tankers for shipment to the 'lower 48' and will also provide for the treatment of oily ballast water for incoming vessels. The degree of treatment required by State and Federal agencies will limit the treated effluent water to 10 mg/l total oil content. The treatment facility will consist of primary gravity separation, secondary dissolved-air flotation with the addition of chemicals, and an outfall/diffuser system terminating in Port Valdez at a depth greater than 100 feet. The environmental background of Valdez Harbor, the applicable laws governing the control of oil pollution and the proposed design of the ballast water treatment facility have been described. (See also W71-12588) (Misra-PAI)
W71-13049

OIL SPILLED WITH ICE: SOME QUALITATIVE ASPECT,
Department of Energy, Mines and Resources, Ottawa, (Ontario). Marine Sciences Branch.
F. G. Barber.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 133-137, 3 fig, 11 ref.

Descriptors: *Oily water, *Sea ice, *Water pollution control, Cleaning, Oil wastes.
Identifiers: *Ice cover, *Oil spill containment, Qualitative data.

If spilled oil is to be removed from water surface it must first be contained. An ice cover can limit oil movement at the surface almost as well as a shore and certain features of an ice cover may be usefully incorporated into the techniques of boom construction and deployment. Observations based on operational association with oil spills have been presented. (See also W71-12588) (Misra-PAI)
W71-13050

PUGET SOUND FISHERIES AND OIL POLLUTION - a Status Report,
National Marine Fisheries Service, Seattle, Wash.
Robert C. Clark, Jr., and John S. Finley.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 139-145, 1 fig, 2 tab.

Descriptors: *Water pollution effects, *Oily water, *Estuarine environment, *Balance of nature, *Fisheries, Aquatic animals, Birds, Fish, Shellfish, Pollution abatement, Legislation, Washington.
Identifiers: Puget Sound, Oil spills.

The Greater Puget Sound Basin is one of the largest oil handling areas on the West Coast of North America. Due to increased local need for petroleum products and the proposed influx of Alaskan North Slope crude oil in the near future, this area will undoubtedly experience even greater petroleum transportation and processing activities. In terms of living resources of economic value - fish, shellfish, waterfowl and aquatic animals - Puget Sound is one of the most productive estuaries on the Pacific Coast. There is increasing evidence that the extensive sport, commercial and aquaculture fisheries resources are threatened by pollution resulting from oil spilled in transport, handling, and use of petroleum. Current efforts by the petroleum industry, state government and federal agencies to protect the environment have been described. Research activities which will provide additional information for minimizing the impact of oil pollution on an already pollution-stressed environment are also discussed. (See also W71-12588) (Misra-PAI)
W71-13051

A JOINT STATE - INDUSTRY PROGRAM FOR OIL POLLUTION CONTROL,
Little (Arthur D.), Inc., Cambridge, Mass. Div. of Water Pollution Control.
R. W. Neal, G. R. Schimke, and D. L. Corey.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 147-155, 8 fig, 3 tab, 7 ref.

Descriptors: *Water pollution control, *Oil, *Programs, *Computer models, *State governments, *Industries, Water pollution sources, Path of pollutants, Estuarine environment.
Identifiers: *Boston, Oil spill containment, Fast-response system.

A description is given of a project undertaken to establish specific measures for reducing the threat of oil pollution and to respond more effectively to oil spills in an intensely utilized estuarine area near Boston. The program included individual plant surveys of all the waterside industrial operations and a sample of inland businesses. To help design a fast-response system for containing and removing spilled oil, the study team developed a computer program that could predict the probable path of oil spilled anywhere in the area under various condi-

tions of wind and tide. This information was used to select locations for containment devices and to determine the speed with which they will have to be deployed. (See also W71-12588) (Misra-PAI)
W71-13052

THE ALBERTA OIL SPILL CONTINGENCY PLAN,
Canadian Petroleum Association, Calgary- (Alberta). Environmental Conservation Committee.
J. G. Gainer.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 157-164, 12 fig.

Descriptors: *Water pollution control, *Oil wells, *Pipelines, *Oil industry, *Industries, *Government, Legislation, Jurisdiction.
Identifiers: *Alberta, *Canada, Contingency plan, Industry-Government cooperation.

The Canadian Petroleum Association has developed a joint Industry-Government Contingency Plan for the control of oil spills throughout the province of Alberta. The plan concentrates on pipeline breaks and spills from wells or other producing facilities and does not concern itself with manufacturing and distribution. The contingency plan purposes a grouping of the 180 producing areas into less than 20 spill control units. Intercompany cooperatives organized in each of these areas would constitute the basic units in the plan, and provide the first line of defense in the event of a major spill. The main features of the plan have been discussed. Recommendations have been presented on legislation, reorganization and reassignment of jurisdiction of governmental agencies required for an effective plan. (See also W71-12588) (Misra-PAI)
W71-13053

DEVELOPMENT OF AN AIR DELIVERABLE ANTIPOLLUTION TRANSFER SYSTEM INCLUDING THE DEVELOPMENT OF AN OPTIMUM OIL STORAGE CONTAINER,
Coast Guard, Washington, D.C., and Goodyear Tire and Rubber Co., Akron, Ohio.
Commander R. J. Ketchel, and H. D. Smith.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 165-177, 18 fig.

Descriptors: *Water pollution control, *Oil wastes, *Storage tanks, *Transfer, Ships, Model studies, Research and development, Oil industry.
Identifiers: Oil spills, Tanker unloading, Oil transfer.

During the past two years development of a special purpose emergency tanker unloading system has been accomplished. The Air Deliverable Transfer Pumping and Storage System (ADAPTS) is now being provided for operational use. This paper traces the development of the system from inception to procurement specifications preparation. Problems encountered during the development effort have been identified. Solutions of these technical and operational problems have been discussed. Field test experience and performance data on the ADAPTS system have been presented. (See also W71-12588) (Misra-PAI)
W71-13054

A CHEMICAL TAGGING SYSTEM FOR USE IN THE PREVENTION OF OIL SPILLS,
American Cyanamid Co., Central Research Div.
R. A. Landowne, and R. B. Wainright.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 179-182, 1 fig, 8 ref.

Descriptors: *Water pollution control, Oil, Oily water, *Tagging, *Pollutant identification, Gas chromatography, Legal aspects.
Identifiers: Oil spills, *Chemical tags, Oil tankers, Oil spill source, Organic Electrophore System.

The bulk handling of various oils, especially crudes and fuel oils, presents many chances for accidental spills. An effective deterrent against pollution due to oil spills would be a tag in the oil to identify the party responsible. Crude petroleum from one field can usually be distinguished from another by analyzing the trace constituents. However, discrimination between operators and carriers who handle the same crude can best be achieved via chemical tags blended into the oil at the time of change of responsibility. The most important criteria for chemical tags are discussed. These include sensitivity, stability in the spill environment, and non-interference with processing and use of the oil. It is also necessary that the tags belong to a system providing a large coding vocabulary. The Organic Electrophore System is believed to satisfy these criteria. Ability to detect a tag at 1 ppb concentration in crude oil using commercially available gas chromatographic instrumentation has been reported. Some unresolved questions have been discussed. (See also W71-12588) (Misra-PAI)
W71-13055

CALIFORNIA CONTINGENCY PLAN FOR OIL AND OTHER HAZARDOUS MATERIAL SPILLS,
California State Div. of Oil and Gas, Sacramento.
John F. Matthews, Jr.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 183-189, 5 fig.

Descriptors: Water pollution control, Oil, Water pollution sources, Oily water, Ships, *California, Project planning, Coordination, *Oil wastes.
Identifiers: Oil spills, *Hazardous material spills, *Contingency plans.

There is a dual approach in California for the contingency plan for spills in that it must tie in with federal plans plus suffice for the needs of local areas within the state. According to the plan one state authority should be in complete charge of the state's response. In addition, the California approach also includes a State Interagency Oil Spill Committee which draws its members from the various affected state agencies. Members of the industrial cooperatives, industry itself, and federal agencies aid by adding input at committee meetings. In organizing the state plan, three basic items have been catalogued: the type of areas within the state, probable sources of pollution including probable quantities, and the capabilities of local areas. Overall regulations must be continually reviewed in relation to the federal plans or local conditions. The State Interagency Oil Spill Committee is charged with this task. (See also W71-12588) (Misra-PAI)
W71-13056

THE ROLE OF THE OIL SPILL COOPERATIVE IN THE OIL PRODUCING INDUSTRY,
Atlantic Richfield Co., Philadelphia, Pa. North American Producing Div.
S. C. Mut.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 191-193.

Descriptors: Water pollution control, Water pollution sources, Oil, Oily water, *Oil industry, *Cooperatives, Coordination, Cleaning, *Oil wastes.
Identifiers: *Oil spills, Contingency plans.

Oil spill cooperatives have been patterned after associations formed by oil companies to assist each other in the event of fires, hurricanes and other disasters. This paper deals only with those cooperatives which involved oil producing facilities with significant spill potential. At the beginning of 1971, there were seven such cooperatives and several others in various stages of formation. The role of the cooperative has been discussed in preparation for and response to an oil spill. The preparation phase entails studies of the area of interest and spill potential, identification of needs for equipment, material and manpower, and training program for personnel. The response phase entails mobilization of the resources of the cooperative under the direction and authority of the party responsible for cleaning up the spill. (See also W71-12588) (Misra-PAI)
W71-13057

OIL SPILL PREVENTION AND DETECTION USING AN INSTRUMENTED SUBMERSIBLE,
Vast, Inc., and Prototypes, Inc.
Wadsworth Owen, and William Leaf.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 195-198, 2 fig, 3 ref.

Descriptors: Water pollution control, Oil, Oily water, Pipelines, Ships, *Ultrasonics, *Fluorometry, Tracers, *Oil wastes.
Identifiers: *Oil spill detection, Submersibles, Underwater inspection.

The advent of a small, inexpensive submersible of limited depth capability makes it economically feasible to use as a platform from which to operate commercial ultrasonic testing apparatus. The mounting configurations and operational procedures for this are outlined. Detection of seepage or breaks in pipes or containers is also economically feasible through the use of fluorometric techniques in conjunction with small submersibles. This may be done by using rhodamine dyes as tracers and submersible-mounted fluorometers to locate seepage and break relations. Other applications for the use of submersible-mounted fluorometers are: inspection of ocean sewer outfall pipes, diffusion of materials at depth, bottom current detection, and detection of oil-filled power cable breaks. (See also W71-12588) (Misra-PAI)
W71-13058

CAUSES OF OIL SPILLS FROM SHIPS IN PORT,
California Dept. of Fish and Game, Sacramento.
Captain W. H. Putnam.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 199-204, 6 tab.

Descriptors: *Water pollution sources, Oil, Oily water, Ships, *Harbors, California, Statistics, Water pollution control, *Oil wastes.
Identifiers: *Oil spills, Los Angeles/Long Beach ports, Oil spill data.

A summary is given of causes of oil spills from ships in the ports of Los Angeles/Long Beach during the period 1962-69. Data on the number and the causes of spills have been tabulated separately for tankships, freighters and Navy vessels. The data on points of escapement of oil from within the ship such as vent tubes, sounding tubes, overflow lines, tank tops, and through-hull fittings, have also been recorded. (See also W71-12588) (Misra-PAI)
W71-13059

REMOVAL OF OIL FROM SUNKEN TANKERS,
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.
Vincent C. Rose, and Gerald C. Soltz.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 205-108, 3 fig, 1 ref.

Descriptors: Water pollution control, Oil, Ships, Underwater, Reclamation, Cleaning, Bacteria, *Oil wastes.
Identifiers: *Sunken oil tankers, *Oil recovery.

A study was conducted on methods of eliminating the oil threat from sunken tankers. The following possibilities were considered: (1) destruction of the tanker and treating the oil on the surface, (2) treating the oil in the tanker, and (3) salvage of the oil. Pumping the oil from the tankers was found to be the most economical and effective solution. The final design was limited to ships laying in one hundred to six hundred feet of water. It incorporates a search operation to locate and buoy the tanker, a preliminary survey to determine the position and the condition of the ship and methods for penetrating the tanks and pumping oil from them. The oil would be removed by dynamically positioning a converted tanker and a diver operation boat over the sunken ship. A ten inch rubber hose would be lowered and secured to the hull with diver operated stud guns. Two penetrations would be made in each oil tank to allow water in and oil out. The hull would be penetrated by either a pneumatically operated circular saw or a large reactionless hole punch. Final cleanup would involve capping the open holes and inoculating each tank with oil-eating bacteria. (See also W71-12588) (Misra-PAI)
W71-13060

NAVY HARBOR OIL POLLUTION ABATEMENT: A PROGRESS REPORT,
Naval Facilities Engineering Command, Washington, D.C.
Jack E. Wilson.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 213-217. 4 fig, 5 ref.

Descriptors: Water pollution control, Oil, Oily water, Harbors, Ships, Project planning, *Cleaning, *Oil wastes, *Pollution abatement.
Identifiers: U.S. Navy, Oil spills, Naval ships, *Harbor cleanup.

A program is now underway to prevent oil spills from Navy ships and shore installations. No oil will be discharged from ship or shore within the territorial sea and no oil collected in port or ashore will be dumped at sea. Naval Facilities Engineering Command (NavFac), which has the responsibility for technical expertise, along with the Naval Civil Engineering Laboratory (NCEL), has underway a rigorous program for developing a harbor cleanup capability. Cleanup systems consisting of containment devices and pickup equipment are being developed. The classes of oil spills have been narrowed to four characteristic categories depending on the size and the environment of the spill. Basic cleanup system concepts applicable to each category have been discussed. (See also W71-12588) (Misra-PAI)
W71-13061

SORBENTS FOR OIL SPILL REMOVAL,
Naval Ship Research and Development Lab., Annapolis, Md.
Paul Schatzberg, and K. V. Nagy.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 221-233, 27 fig, 9 ref.

Descriptors: Water pollution treatment, Oil, Oily water, *Sorption, Separation techniques, Laboratory tests, Cleaning, *Oil wastes.
Identifiers: *Oil spills, Treating agents, Polymorphic foams, *Sorbent materials.

Materials that float on water, attract and absorb oil, and can easily be removed from the water constitute one of the most effective means for completely separating spilled oil from the water environment. Three classes of materials can be used for this purpose: inorganic products, natural organic products, and synthetic organic products. Several examples of each of these classes are evaluated for their potential use as sorbents. Laboratory procedures are utilized to determine oil and water sorption capacity, oil retention capacity, buoyancy with and without absorbed oil, effect of petroleum product variation, and sorbent/oil coherence. Of twenty sorbent materials evaluated, the polymorphic foams exhibited the highest sorption capacities for oils. These foams also absorb water. While this reduces their capacity for oil, some of the foams still retain a high sorption capacity. On the average, much lower oil sorption capacities were exhibited by the inorganic and the natural organic materials. (See also W71-12588) (Misra-PAI)
W71-13062

LABORATORY INVESTIGATION INTO THE SINKING OF OIL SPILLS WITH PARTICULATE SOLIDS,
Shell Research Ltd., Egham (England). Egham Research Labs.; and Koninklijke/Shell-Laboratorium, Amsterdam (Netherlands).
O. Pordes, and L. J. Schmit Jongbloed.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 235-244, 1 fig, 6 tab, 3 ref.

Descriptors: Water pollution treatment, Oil, Oily water, *Emulsions, Laboratory tests, Cleaning, *Oil wastes, Water pollution control.
Identifiers: Oil spills, Oleophilic sand surfaces, *Sinking of oil slicks, *Treating agents.

Experimental laboratory work relevent to the sinking of floating oil spills has been described. The results show that aqueous sand slurries treated with an amine acetate salt have satisfactory sinking and retention properties. In general, aqueous sand slurries containing cationic wetting agents of widely different water solubilities can affect sinking provided that the concentration of the wetting agent is within the range necessary to give oleophilic sand surfaces. To sink stable water-in-oil emulsions effectively a sinker application rate is required which allows for the cohesive structure of the emulsion as well as for the wetting of the sinker by the oil phase. The feasibility of preventing carpet formation by sunken oil/solid masses by reducing the size of the sinking oil/solid droplets and delaying or preventing their coalescence by spraying a dispersant onto the oil has been discussed. Standard laboratory procedures in direct support of the Shell Sand Sink method have been emphasized. (See also W71-12588) (Misra-PAI)
W71-13063

BURNING AGENTS FOR OIL SPILL CLEANUP,
Edison Water Quality Lab., N. J; and Department of the Navy, Washington, D.C.
Arnold Freiberger, and John M. Byers.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 245-251, 7 fig, 8 ref.

Descriptors: Water pollution control, Oil, Oily water, *Cleaning, Burning, Laboratory tests, On-site investigations, *Oil wastes.
Identifiers: *Oil slicks, Oil spills, *Burning agents.

Burning of oil slicks offers a means of eliminating spilled oil, however, the heavier crudes and fuel oils require the addition of burning agents to assist in ignition and in sustaining combustion. The advantages of burning oil slicks are presented, and currently available commercial burning agents listed. Results of laboratory and field tests of a variety of burning agents are given, and several incidents where burning was used in an actual oil spill reported. Current and potential developments in this area are described. (See also W71-12588) (Misra-PAI)
W71-13064

ASSESSMENT OF OIL SPILL TREATING AGENT TEST METHODS,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
J. R. Blacklaw, J. A. Strand, and P. C. Walkup.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 253-261, 3 tab, 15 ref.

Descriptors: Water pollution treatment, Oil, Oily water, Cleaning, Dispersion, Sorption, Biodegradation, Laboratory tests, Evaluation, Test procedures, Water pollution Control, *Oil wastes.
Identifiers: Oil spills, *Treating agents, *Sinking agents, *Dispersants, *Sorbents, Combustion promoters, Gelling agents.

A summary is given of laboratory methods currently being used for evaluating oil spill treating agents. Treating agents are classified as dispersants, sinking agents, combustion promoters, biodegradants, gelling agents, and beach cleaners. The mechanisms and chemical reactions controlling the field application of each type of agent are defined. Parameters critical to the evaluation of both the effectiveness and toxicity of each type of agent are outlined. The present methods of laboratory measurements are reviewed for the adequacy of parameter control as well as the appropriateness of the variables measured. No existing tests were found capable of reproducibility and accurately measuring the effectiveness or toxicity of an oil spill treating agent. Some, however, can be improved. Procedures, equipment, and material specifications for laboratory effectiveness and toxicity measurement are given. (Misra-PAI)
W71-13065

OIL SPILL DISPERSANTS - CURRENT STATUS AND FUTURE OUTLOOK,
Esso Research and Engineering Co., Linden, N. J.
Gerald P. Canevari.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 263-270, 3 fig, 2 tab, 33 ref.

Descriptors: Water pollution control, Oil, Oily water, *Dispersion, Emulsions, Toxicity, Balance of nature, *Biodegradation, Cleaning, *Oil wastes.
Identifiers: Oil spills, *Chemical dispersants.

The biological and operational aspects of the laboratory efforts and field applications of the chemical dispersants for handling oil spills are reviewed. Improvements in the formulation of dispersants during the past several years are discussed. These innovations involve modifications to improve effectiveness, application techniques, and toxicological properties. A brief outline of the mechanisms of dispersing is presented to permit a better understanding of these modifications and the manner in which the changes influence dispersant properties. The ultimate use that the dispersant might find is predicated on the determination of the long-range effects of the dispersed oil droplets in the water column. (See W71-12588) (Misra-PAI)
W71-13066

DISPERSANT USE VS WATER QUALITY,
Edison Water Quality Lab., N.J.
Richard T. Dewling, J. Stephen Dorrler, and George D. Pence, Jr.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 271-277, 3 fig, 2 tab, 21 ref.

Descriptors: Water pollution control, Oil, Oily water, *Dispersion, *Chemicals, *Emulsions, *Toxicity, Water quality, Biodegradation, Biochemical oxygen demand, *Oil wastes.
Identifiers: Oil spills, Chemical dispersants, Ultimate oxygen demand.

Following the use of highly toxic detergents during the Torrey Canyon incident, considerable attention has been given to the study of effects of toxicity of these chemicals on marine life. From the standpoint of water quality, the rate of degradation and the ultimate oxygen demand of the dispersant

and/or dispersant-oil mixtures should also be studied carefully. These considerations are particularly important in inland and coastal polluted waters, but appear to have received little attention. Data based on laboratory tests on oxygen demands for several dispersnats are given. (See also W71-12588) (Misra-PAI)
W71-13067

DEVELOPMENT OF TOXICITY TEST PROCEDURES FOR MARINE PHYTOPLANKTON,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Lab.
J. A. Strand, W. L. Templeton, J. A. Lichatowich, and C. W. Apts.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 279-286, 6 fig, 2 tab, 31 ref.

Descriptors: *Water pollution effects, Oil, Oily water, *Dispersion, *Emulsions, *Toxicity, Bioassay, Phytoplankton, Primary productivity, Marine animals, Test procedures, *Oil wastes.
Identifiers: Oil spills, Oil dispersants, Toxicity tests.

Recommended bioassay procedures are presented that can be routinely applied to evaluated the relative toxicity of oil, chemical dispersants, and oil-dispersant mixtures to naturally occurring populations of phytoplankton, and representative marine phytoplankters grown in pure culture. The methods presented, in general, represent application of techniques routinely employed in the measurement of marine primary productivity and the application of the Inhibitory Toxicity Test, a tentative method devised by the American Society for Testing and Materials to evaluate acute toxicity of industrial wastes to diatoms. (See also W71-12588) (Misra-PAI)
W71-13068

MICROBIAL DEGRADATION OF A LOUISIANA CRUDE OIL IN CLOSED FLASKS AND UNDER SIMULATED FIELD CONDITIONS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
Howard Kantor, C. H. Oppenheimer, and R. J. Miget.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 287-296, 6 fig, 6 tab, 6 ref.

Descriptors: *Water pollution treatment, Oil, Oily water, *Degradation (Decomposition), *Microorganisms, Oxidation, Water pollution control, *Oil wastes.
Identifiers: Oil spills, Oil slicks, Microbial culture, *Crude oil, Saturated paraffins.

Petroleum utilizing microorganisms in flasks containing enriched seawater exhibited a clear metabolic preference for saturated paraffins in Louisiana crude oil. The rates of oxidation of these compounds were directly proportional to incubation temperature and roughly doubled with a ten degree increase. A pattern of growth consisting of an initially large of saturated paraffin oxidation, followed by a decrease and another increase was observed. The initially large rates were attributed to the metabolism of n-paraffins smaller than C-18. No even or odd chain length preference for n-paraffins was indicated. There was no evidence of utilization for aromatic compounds. Application of a microbial culture to an oil slick under simulated field conditions clearly showed that microbes could accelerate the removal of Louisiana crude oil from an oil slick on seawater. The rates of oil removal in outdoor, exposed conditions were twice as large as the rates of evaporative oil loss. The microbes produced a significant change in oil 'stickiness'. Measurements indicated that the oil was dispersed through microbial activity. The cells preferentially remained at the oil-water interface during experimental periods. (See also W71-12588) (Misra-PAI)
W71-13069

TOXICITY OF OIL DISPERSING AGENTS DETERMINED IN A CIRCULATING AQUARIUM SYSTEM,
Battelle Memorial Inst., Columbus, Ohio. William F. Clapp Labs.
Robert H. Engel, and Marilynn J. Neat.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 297-302, 10 fig, 3 tab, 4 ref.

Descriptors: Water pollution control, Oil, Oily water, *Dispersion, *Bioassay, *Toxicity, Aquatic environment, Marine animals, Dissolved oxygen, Water pollution effects, *Oil wastes.
Identifiers: Oil spills, Oil dispersants, Circulating aquarium system, Dispersant toxicity.

The toxicity of two non-ionic oil-dispersing agents was determined on the following marine species: the edible mussel Mytilis edulis, winter flounder, soft shell clam, mummichog, Atlantic silversides, and fourth stage lobster larvae. The bioassay system used consisted of a series of storage reservoirs and exposure tanks with a volume of 112 litres. Water movement was provided by a series of marine aquarium pumps which circulated water at a rate of 4 litres/min. Additional aeration was not required for the mummichog, mussel or fourth stage lobster larvae. At 20C, TL50's calculated from 24 to 96 hours fell between 30 and 75 mg/1, with no significant difference in toxicity between the two dispersants. At 5C toxicity in the mummichog was significantly lower; this may be explained by the accompanying higher oxygen levels. The advantages of the circulating aquarium system in relation to the static and continuous-flow bioassay systems are discussed. (See also W71-12588) (Misra-PAI)
W71-13070

A STUDY OF THE PERFORMANCE CHARACTERISTICS OF THE OLEOPHILIC BELT 'OIL SCRUBBER',
Shell Pipe Line Corp., Houston, Tex. Research and Development Lab.
J. P. Oxenhan.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 309-317, 12 fig, 2 tab, 6 ref.

Descriptors: Water pollution control, Oil, Oily water, *Reclamation, Oil-water interface, Absorption, Separation techniques, *Oil wastes.
Identifiers: Oil spills, *Oleophilic belts, Physical removal, Recovery rate, *Oil scrubber.

Analyses and experimentation have indicated that the maximum recovery rate of an oleophilic belt oil recovery system is generally limited by the rate at which oil may be transferred to the belt surface and interior. The rate of absorption of oil by an oleophilic belt increases with increasing specific surface and permeability of the belt material, increasing slick depth, decreasing oil viscosity, and decreasing interfacial tension between the oil and the belt material. In operations with high viscosity oils and high belt speeds significant quantities of oil may be withdrawn on the belt's outer surface. The oil scrubber's performance is not detrimentally affected by the presence of waves, nor by the presence of solid materials, emulsions, or 'rag' in limited quantities. The stability of the belt is the primary concern for operations in the presence of transverse currents. (See also W71-12588) (Misra-PAI)
W71-13072

FREE VORTEX RECOVERY OF FLOATING OIL,
Scientific Associates, Inc., Santa Monica, Calif., and California Univ., Santa Barbara.
Eugene B. Nebeker, Sergio E. Rodrigues, and Paul G. Mikolaj.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 319-327, 7 fig, 1 tab, 7 ref.

Descriptors: Water pollution control, Oil, Oily water, *Reclamation, *Oil-water interface, *Vortices, Impellers, Model studies, Separation techniques, *Oil wastes.
Identifiers: Oil spills, Oil slicks, Recovery rate, Vortex flow.

A concept employing a free vortex for use in recovering oil from high seas oil spills is presented. An experimental evaluation program has been completed which demonstrates the feasibility of this concept as well as the design limitations. An oil slick will migrate toward the center of the vortex due to the action of the water flow induced by an impeller. At an appropriate speed of rotation, the oil will submerge and accumulate within a central region of the vortex. This pocket will contain a concentrated mass of oil which can readily be removed by conventional pumping. Tests were performed with a free vortex oil recovery model having an impeller diameter of one foot. Performance data were obtained both under quiescent water conditions and also under environmental conditions that simulated 10-foot deep water waves, 20-knot winds, and 2-knot currents. Detailed scaling considerations based on the test data indicate that prototype device with a diameter of the order of 4 feet would be operable in all typically occuring 10-foot seas. Depending on its size, the prototype will recover in excess of 100 gallons per minute oil with an oil-to-water ratio greater than 1.2 when operating with a crude oil film of only o.1 inch in thickness. (See also W71-12588) (Misra-PAI)
W71-13073

CONCEPT DEVELOPMENT OF A POWERED ROTATING DISK OIL RECOVERY SYSTEM,
Atlantic Research Systems Div., Costa Mesa, Calif.
S. T. Uyeda, R. L. Chuan, A. C. Connolly, and Philip O. Johnson.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 329-338, 2 tab, 14 fig.

Descriptors: Water pollution control, Oil, Oily water, *Separation techniques, *Reclamation, Boundary layers, Design data, *Oil wastes.
Identifiers: Oil spills, Recovery rate, *Rotating disk.

A simple technique for the recovery of oil from water surface is by the use of rotating disks which are preferentially wet by oil, which can be collected with wipers. The feasibility of this system for the recovery of oil from the ocean surface has been established. The rotating disk system has been shown to offer a high oil pickup with little or no water pickup. The other advantages are: recovery of thin oil slicks, recoveries of oils with varying viscosities and emulsification, relative insensitivity to waves and currents, and minimum tendency to emulsify oil. A summary of the theoretical development and comparison with experimental data is presented. The recommended design for a 50,000 gallons per hour capacity system and several concepts for utilization with booms and barriers are illustrated. (See also W71-12588) (Misra-PAI)
W71-13074

LOCKHEED OIL SPILL RECOVERY DEVICE,
Lockheed Missiles and Space Co., Sunnyvale, Calif. Research and Development Div.
Barrett Bruch, and K. R. Maxwell.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 339-356, 25 fig, 5 ref.

Descriptors: Water pollution control, Oil, Oily water, *Separation techniques, *Reclamation, Model studies, Design data, *Oil wastes.

Identifiers: Oil spills, Recovery rate, *Rotating disks.

A design concept, based on a Lockheed proprietary oil recovery device, for highseas oil spill recovery has been described. The device consists of closely packed vertical disks, which are nominally half immersed in the water. The rotation of these disks through a layer of oil creates a viscous shear which attaches the oil to the disks. The recovery effectiveness of the device has been studied theoretically and experimentally. The forward way scaling was found to be by the square-foot of the device diameter and oil recovery rate by 5/2 power. An 8-ft-diameter, 10-ft-long device in sea state 4 and a 2-kt current could recover 8,600 bbls of light oil per day with less than 25 per cent additional free water, and in calm seas, 17,200 bpd. Within containment booms, 1 to 4 in. of oil are required for maximum recovery. Performance of the device under varying conditions has been discussed. (See also W71-12588) (Misra-PAI)
W71-13075

THE DEVELOPMENT OF TEST PROCEDURES FOR THE ASSESSMENT OF EFFICIENCY IN BEACH CLEANING,
Warren Spring Lab., Stevenage (England).
P. G. Jeffrey.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 357-360.

Descriptors: Test procedures, *Cleaning, *Beaches, Oil, Oily water, Laboratory tests, Dispersion, Calibrations, Spectrophotometry, Water pollution control, *Oil wastes.
Identifiers: Oil spills, *Beach cleaning, Standardized test procedures, Oil dispersants.

A variety of materials has been suggested for the removal of split oil from beaches, rocks and shoreline structures. These vary considerably in composition, toxicity, efficiency and cost. Early test procedures, developed in 1961, were concerned only with efficiency in cleaning and were demonstrably non-reproducible. Since that date considerable efforts have been made to refine the procedures in use, and to introduce new tests closely allied to the beach cleaning process. Recent developments in this field at Warren Spring Laboratory, and the procedure used at present for the assessment of these materials for beach cleaning in the United Kingdom are described. (See also W71-12588) (Misra-PAI)
W71-13076

INVESTIGATION OF THE USE OF A VORTEX FLOW TO SEPARATE OIL FROM AN OIL-WATER MIXTURE,
United Aircraft Research Labs., East Hartford, Conn.
Arthur E. Mensing, and Richard C. Stoeffler.
In: Joint Conference on the Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 361-368, 10 fig, 2 tab.

Descriptors: Water pollution control, Oil, Oily water, *Separation techniques, Reclamation, Vortices, Model studies, Optimization, *Oil wastes, *Oil-water interfaces.
Identifiers: Oil spills, Recovery rate, *Vortex flow.

The use of a continuous-flow vortex separator as a component of an oil spill cleanup system was investigated. Tangential injection of the oil-water mixture into the vortex tube produces buoyant forces which accelerate the lighter oil to vortex axis. The cleaned water and the core containing the oil are exhausted through exit ports in the opposite end walls of the vortex tube. The cleansed water would be returned to the sea and the core flow containing the oil would be stored. Tests of laboratory-scale model vortex separators were made using oil-water mixtures having inlet oil-to-total flow ratios between 0.002 and 0.3 and for a variety of geometric and flow conditions. The tests were made using four types of oils having viscosities at 75 deg F between 3 and 4250 cps and specific gravities between 0.83 and 0.97. The results showed that the separator performance may be optimized by proper control of the oil exhaust flow. Under optimum conditions, approximately 90 percent of the injected oil was recovered, and the captured oil contained approximately 90 percent oil. Design characteristics of a full-scale vortex separator system are discussed. (See also W71-12588) (Misra-PAI)
W71-13077

'DYNAMIC KEEL' OIL CONTAINMENT SYSTEM,
Ocean Systems, Inc., Reston, Va.
Frank March.
In: Joint Conference on the Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 369-380, 15 fig.

Descriptors: Oil, Oily water, *Barriers, Water pollution control, *Model studies, Theoretical analysis, Stability, Currents (Water), *Oil wastes.
Identifiers: *Containment, *Polyurethane foam, Oil slicks.

An oil containment system for use on the high seas has been described. The system is designed to contain oil in 4-5 foot seas in combination with 20 miles per hour winds and 0.7-1 knot currents in a nominal water depth of 200 feet and up to 30 miles from shore. The barrier design is based on the use of flexible polyurethane foam with a 'dynamic keel' that imparts high static and dynamic stability. The barrier consists of a non-water-absorbing foam package that provides buoyancy and a surface barrier, and a water-absorbing foam package that provides a submerged barrier and serves as a 'dynamic keel'. The two packages are connected into an integral unit that can be compressed to approximately 20 percent of the original volume for storage and transportation. No compressors, pumps and other mechanical support equipment are required. Results of analytical studies and model testing are presented to indicate the effectiveness of the system. (See also W71-12588) (Misra-PAI)
W71-13078

PNEUMATIC BARRIERS FOR OIL CONTAINMENT UNDER WIND, WAVE, AND CURRENT CONDITIONS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
David R. Basco.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 381-391, 11 fig, 1 tab, 5 ref.

Descriptors: Water pollution control, Oil, Oily water, *Barriers, *Currents (Water), Model studies, Ocean waves, *Oil wastes.
Identifiers: Oil spills, Oil slicks, *Containment, *Pneumatic barriers, Air bubble generated currents.

The results of an experimental laboratory study of the pneumatic barrier for containment of oil have been presented. Both the fluid mechanics of air bubble generated currents and their effectiveness for containing oil under wind, wave, and current loadings were investigated. The bubble-generated current has been found to provide an effective means of containing oil on water. However, under strong currents (2 knots) or breaking wave conditions, large quantities of air are required and the increase in power requirements may prove the system uneconomical for some applications. Consequently, use of the pneumatic barrier to prevent oil spreading on water is recommended for protected areas with low (below 1.0 knot) currents. (See also W71-12588) (Misra-PAI)
W71-13079

THEORETICAL AND EXPERIMENTAL EVALUATION OF OIL SPILL CONTROL DEVICES,
Poseidon Scientific Corp.
Wilbur Marks, Gunther R. Geiss, and Julius Hirshman.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p. 393-404, 5 fig.

Descriptors: Oil, Water pollution control, Oily water, *Barriers, Mathematical models, Loads (Forces), Structural analysis, Failures, Evaluation, *Oil wastes.
Identifiers: Oil spills, *Containment devices, *Booms.

Description is given of the first phases of a program aimed at providing a means for evaluation of existing oil containment devices (booms, barriers, etc.) and for improving basic design through variation of geometric and physical parameters. A mathematical/computer model is derived that describes the behaviour (forces and motions) of a spill control device in given environmental conditions of wind, current, and waves, and specified deployment configuration. The results of evaluation of 14 booms in terms of probability of mechanical (structural) and spill-control failure are discussed in general terms, as are the results of model-tank tests aimed at obtaining data for comparative evaluation of booms and for validating and improving the analytical model. (See also W71-12588) (Misra-PAI)
W71-13080

STUDY OF EQUIPMENT AND METHODS FOR REMOVING OR DISPERSING OIL FROM OPEN WATERS,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
C. H. Henager, P. C. Walkup, J. R. Blacklaw, and J. D. Smith.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 405-414, 1 fig, 3 tab, 9 ref.

Descriptors: Oil, Oily water, Water pollution control, *Dispersion, *Burning, Cost-benefit analysis, Balance of nature, Toxicity, Evaluation, *Oil wastes.
Identifiers: *Oil removal, Containment booms, Removal rate, Cost effectiveness.

A cost effectiveness analysis has been presented for equipment, materials and techniques applicable to the removal or dispersal of spilled oil from U.S. Navy oilers and gasoline tankers on open waters. Effectiveness parameters considered are: oil product types (JP-5, Distillate Fuel, Navy Special and Bunker C), range of spill locations (3 and 12 miles from shore) and varying spill sizes (2,700 gal, 270,000 gal, and 6,750,000 gal). Criteria for evaluation of systems under the above parameter situations, formulated for presently available equipment and materials, include: completeness of oil removal; hazard and pollution; use in limited access areas; sensitivity to expected environmental factors; sensitivity to temperature extremes; toxicity to marine life; and system availability. The three most cost effective systems were found to be burning, dispersing, and mechanical skimming. Considering system applicability to various products and the requirements of rate of removal for massive spills, the most practical system with a favorable cost effectiveness ratio was found to be dispersing. This is followed by dispersing plus a containment boom. Burning agents directly applied to the spill, though limited in applicability, were found to be the third best system in terms of cost effectiveness. (See also W71-12588) (Misra-PAI)
W71-13081

SOME EFFECTS OF OIL POLLUTION IN MILFORD HAVEN, UNITED KINGDOM,
Field Studies Council, Pembroke (England). Oil Pollution Unit.
E. B. Cowell.

In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 429-436, 5 fig, 37 ref.

Descriptors: Water pollution effects, Oil, Oily water, *Detergents, *Emulsifiers, *Toxicity, *Dispersion, Oil industry, *Balance of nature, Salt marshes, On-site tests, Laboratory tests, *Oil wastes.
Identifiers: Oil spills, *Milford Haven, *Refinery discharges, Rocky shores, Long term effects.

Research on the biological effects of oil pollution and detergent cleaning operations within the port of Milford Haven is described. Observations made on accidental spillages, experimental field spillages and laboratory investigations confirm that both salt marsh communities and rocky shores do normally recover from oil pollution accidents but that shore cleaning with emulsifiers can do serious damage if misused, although recovery follows. The effects of some new emulsifiers which are up to 1000X less toxic are discussed. Chronic pollution damage from refinery discharges has been identified both in Milford Haven and elsewhere, but it has been shown that these effects are eliminated if the outfall pipes are located offshore in locations of good dispersion and currents. Long term surveys reveal no widespread long term damage to fauna and flora of Milford Haven attributable to the development of the oil port. (See also W71-12588) (Misra-PAI)
W71-13083

THE INFLUENCE OF OIL AND DETERGENTS ON RECOLONIZATION IN THE UPPER INTERTIDAL ZONE,

University of Southern California, Los Angeles. Allan Hancock Foundation.
Dale Straughan.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971. p 437-440, 4 tab, 5 ref.

Descriptors: Water pollution effects, Oil, Oily water, *Detergents, *Intertidal areas, *Algae, Asbestos, Laboratory tests, *Oil wastes, Water pollution control.
Identifiers: Oil spills, *Oil dispersants, *Intertidal organisms, *Recolonization, Recovery, C. fissus, Chthamalus.

This paper presents the first in a series of experiments designed to investigate the problem of recovery in the upper intertidal zone after an oil spill. Data on the effects of oil, and oil and dispersants on recolonization are presented. These experiments were conducted on relatively small isolated asbestos surfaces. Recolonization of these asbestos fouling plates treated variously with oil and detergents was found to be dependent on the season of the year. The presence of oil favored C. fissus settlement but retarded algal settlement. (See also W71-12588) (Misra-PAI)
W71-13084

SOURCES AND BIODEGRADATION OF CARCINOGENIC HYDROCARBONS,

Scripps Institution of Oceanography, San Diego, Calif.
Claude E. ZoBell.
Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., In: June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971, p 441-451. 8 tab, 2 fig, 107 ref.

Descriptors: *Water pollution sources, *Oil, *Biodegradation, *Synthesis, *Metabolism, Marine bacteria, Algae, Marine animals, *Oil wastes, Water pollution control.
Identifiers: *Oil spills, *Carcinogenic hydrocarbons, *Biosynthesis, Combustion products.

Carcinogenic hydrocarbons (CHC) are widely distributed in air, soil, marine mud, water, oils (vegetable as well as mineral), and other materials. Most organisms appear to contain little or no CHC, but from 1 to more than 1,000 g/kg has been detected in certain plants and animals. A major source of CHC is the combustion or pyrolysis of carbonacious materials, including fossil fuels, organic refuse, forest fires, etc. Airborne, liquid, or solid pollutants tend to find their way into soil, streams, lakes, and the sea. Pertinent to the problem of oil spills is the quantity of CHC contributed by such spills as compared with that from aerial transport, terrestrial drainage, biosynthesis of CHC, and other sources. Evidence is presented for the synthesis of carcinogenic hydrocarbons by various species of bacteria, algae, and higher plants. Although some may be retained by their tissues, a good many animals metabolize various CHC and excrete the oxidation products. In most aquatic environments as well as in moist aerobic soil, bacteria bring about degradation of CHC. (See also W71-12588) (Misra-PAI)
W71-13085

CLEANING AND REHABILITATION OF OILED SEABIRDS,

Goteborg Univ. (Sweden).
Goran Odhan.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971, p 453-456. 4 fig, 2 tab, 5 ref.

Descriptors: Oil, Oily water, Water pollution effects, *Detergents, *Cleaning, *Water birds, Water pollution control, *Oil wastes.
Identifiers: *Seabirds, Plumage, Wax, *Cleaning agents, *Larodan 127, Chemical composition.

The water repellant property of the plumage of the seabirds depends upon the texture of the feathers and the presence of a water-proofing wax produced by the preen gland at the bird's rear. Oil has been found to impair two important qualities of the plumage: water repellency and heat insulation. When detergents are used to wash oiled seabirds the natural feather wax is removed. To overcome this problem a new cleaning agent, Larodan 127, was formulated. This cleaning agent consists of a crystalline dispersion of hydrophilic lipid crystals in water with unit wax embedded, in the crystal matrix. The formation of lipid crystal dispersion and its structure and properties are described. (See also W71-12588) (Misra-PAI)
W71-13086

INITIAL AGING OF FUEL OIL FILMS OF SEA WATER,

Virginia Inst. of Marine Science.
Craig L. Smith, and William G. MacIntyre.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971, p 457-461. 6 fig, 3 tab, 2 ref.

Descriptors: Oil, *Oil-water interfaces, *Films, *Aging (physical), *Weathering, *Evaporation, *Solubility, Biodegradation, Laboratory tests, *Volatility, Water pollution control, Oil wastes.
Identifiers: Oil spills, Oil slicks, Dissolution.

The process of aging or weathering of nos. 2, 4, and 6 fuel oil films on sea water has been studied both in laboratory apparatus and at sea. Loss of oil components by evaporation and dissolution was considered to be the main mechanism of the initial weathering. The rates of evaporation of each oil type and comparison of relative importance of evaporation and dissolution are reported. During the initial weathering period, the rate of evaporative loss of weight of a given fuel oil was found to be proportional to the percentage of volatile compounts (i.e. with boiling points less than 270C) in the oil. The experiment showed that the medium molecular weight aromatic hydrocarbons comprise the greatest proportion of the dissolved compound in seawater. Predominant are the methyland the dimethyl-nephthalenes. The dissolution of the lower molecular weight aromatics seems to be offset by their high rates of evaporation, while the high molecular weight aromatics are limited by their solubility. At sea, the onset of whitecapping and breaking waves was shown to produce large accelerations of evaporation loss of compounds with boiling points less than 270C. (See also W71-12588) (Misra-PAI)
W71-13087

A DISCUSSION OF THE FUTURE OIL SPILL PROBLEM IN THE ARCTIC,

Coast Guard, Washington, D.C. Office of Research and Development.
J. L. Glaeser.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971, p 479-484. 6 fig, 23 ref.

Descriptors: Water pollution control, *Arctic, *Oil fields, *Pipelines, Oil, *Biodegradation, *Absorption, *Dispersion, *Aging (Physical), Balance of nature, Oil wastes.
Identifiers: *Oil spills.

The causes and effects of potential pollution problems associated with oil production in the Arctic regions are discussed. An oil spill on water surface is subject to several natural processes: dispersion, evaporation, solution, absorption, biodegradation, and ultra-violet oxidation. The relative effect of each process is discussed on the basis of the results of the U.S. Coast Guard's Arctic Oil Spill Test Program. The results of oil spreading experiments on/under ice and on water are presented. The results of physical and chemical analyses of oil samples aged in Arctic environment are also given. (See also W71-12588) (Misra-PAI)
W71-13088

EFFECTS OF EXPOSURE TO OIL ON MYTILUS CALIFORNIANUS FROM DIFFERENT LOCALITIES,

University of Southern California, Los Angeles. Allan Hancock Foundation; and Humboldt State Coll., Arcata, Calif. Dept. of Biology.
Robert Kanter, Dale Straughan, and William N. Jessee.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971, p 485-488. 2 fig, 4 ref.

Descriptors: Water pollution effects, Oil, Oily water, *Mussels, *Mortality, Laboratory tests, On-site data collection, Oil wastes.
Identifiers: Oil seepage, *M. californianus, *Tolerance.

The results of the first two of a series of experiments in a study to determine if organisms exposed to natural oil seepage have a higher tolerance to a spill of similar crude oil than organisms that have not been exposed to similar seepage are presented. Mytilus californianus from different localities among the California Coast were exposed to varying crude oil concentrations in the laboratory. The data shows a higher tolerance to oil in M. californianus from a natural oil seep area than in those from non-oil seep areas. There is also a different tolerance to oil between M. californianus from different non-oil seep areas. (See also W71-12588) (Misra-PAI)
W71-13089

AN INTEGRATED PROGRAM FOR OIL SPILL CLEANUP,

Esso Research Centre, Abingdon (England); Esso Petroleum Co. Ltd., London (England).
W. E. Betts, H. I. Fuller, and H. Jagger.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971, p 497-504. 3 fig, 10 ref.

Descriptors: Water pollution control, Oil, Oily water, Water pollution treatment, *Administrative

agencies, *Local governments, *Oil industry, Planning, Oil wastes.
Identifiers: *Oil spills, *Contingency planning, United Kingdom.

A discussion is given of the necessary requirements of an integrated program for dealing with oil spills on water. Such a program necessarily involves a designated administrative organization, sound contingency planning, pre-selection of equipment and materials to cover a range of techniques, and a recognition of the importance of flexibility so that the proper combination of techniques can be combined into the optimum operation to meet the special circumstances of each individual spill. This philosophy is illustrated by a description of the administrative organization in the United Kingdom at central and local government level, by the contingency planning of one of the major oil companies, and by the different combinations of confinement, removal, and other techniques that have proved appropriate in Europe for water surfaces ranging from streams to seas. (See also W71-12588) (Misra-PAI)
W71-13090

EVALUATION OF SELECTED EARTHMOVING EQUIPMENT FOR THE RESTORATION OF OIL-CONTAMINATED BEACHES,
URS Research Co., San Mateo, Calif.
James D. Sartor and Carl R. Foget.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971, p 505-522. 20 fig, 12 tab, 11 ref.

Descriptors: Oil, *Beaches, *Sands, *Cleaning, *Earth handling equipment, *Cost analysis, Evaluation, On-site tests, Water pollution control, Oil wastes.
Identifiers: *Oil spills, *Beach restoration.

The findings have been reported of a study to evaluate the use of selected earthmoving equipment in oil-contaminated beach restoration operations. Specifically, the objectives of the study were: to determine modifications and cost required to improve capacity of selected equipment; to develop optimum operating procedures for each method; to determine, through field tests, the operating cost of each method. The first phase of the study entailed review of procedures utilized in previous beach restoration operations and survey of the commercially available earth moving equipment. In the second phase full scale tests were conducted to demonstrate the restoration procedures developed and to determine the efficiency of each procedure/equipment. The oil removal effectiveness was greater than 98% for all restoration procedures. The highest effectiveness was achieved using the motorized grader and motorized elevating scraper working in combination. The tracked front end loaders were least effective. On beaches possessing low shear strength, flotation tires or steel-belted half-tracks on the motorized grader and a non-self-propelled elevating scraper with a tracked prime mover should be used. (See also W71-12588) (Misra-PAI)
W71-13091

FROTH FLOTATION CLEANUP OF OIL-CONTAMINATED BEACHES,
Mel-Lab, Inc., Springfield, Va. Meloy Labs.
Garth D. Gumtz, and Thomas P. Meloy.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971, p 523-531. 2 fig, 6 tab.

Descriptors: Oil, *Beaches, *Sands, *Froth flotation, *Cleaning, Feasibility studies, Model studies, Reclamation, Water pollution control, *Oil wastes.
Identifiers: Oil spills, Oil-contaminated beaches.

Results are presented of laboratory studies and demonstration studies of froth flotation scheme. The objectives of the laboratory studies were to show the feasibility of flotation cleaning of oil contaminated beach sand and to develop a quantitative method for measuring oil contamination levels. The demonstration studies were conducted with a 30 tons per hour froth flotation plant. The essential elements of plant operation were: a froth flotation machine, belt feeder, oil recovery tank, process water pump, water supply, elevating scraper, and front end loader. Demonstrations ranged from nominal runs with feed rate of 30 tons per hour and oil concentrations of 0.5% to one run at 60 tons per hour and another with an oil concentration approaching 3%. The demonstrations served to show that the froth flotation is an adequate cleaning procedure without recourse to an auxiliary scrubbing operation. (See also W71-12588) (Misra-PAI)
W71-13092

A HOT WATER FLUIDIZATION PROCESS FOR CLEANING OIL-CONTAMINATED BEACH SAND,
California Univ., Santa Barbara; and Standard Oil Co. of California, San Francisco.
Paul G. Mikolaj and Edward J. Curran.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971, p 533-539. 3 fig, 1 tab, 8 ref.

Descriptors: Oil, *Beaches, *Sands, Water pollution sources, *Cleaning, *Feasibility studies, Model studies, Separation techniques, Water pollution control, Oil wastes.
Identifiers: *Oil spills, *Fluidization process, *Beach cleaning.

A pilot device capable of cleaning one ton per hour of oil-contaminated beach sand was built and tested. The processing scheme was a variation of the hot water method used in the Athabasca Tar Sand Deposits and utilized liquid fluidization to effect the soil-sand separation. Tests performed with a sand mixture containing 1 to 2 percent of a 23 deg API crude oil showed that upwards of 95 percent of the oil could be removed. Operation with a 14 deg API residual oil was less satisfactory. The hot water fluidization process is judged to be a technically feasible concept although there appear to be definite limitations as to the general applicability. These limitations are concerned primarily with the range of sand particle sizes that can be fluidized without excessive elutriation. Additional experimentation is needed to further delineate the range of potential application. (See also W71-12588) (Misra-PAI)
W71-13093

THE STATE'S ROLE IN OIL SPILL CLEANUP,
Epro Oceanographic Inst., and Marsan Corp., Elgin, Ill.
John D. Harper.
In: Joint Conference on Prevention and Control of Oil Spills, Washington, D.C., June 15-17, 1971. Washington, D.C., American Petroleum Institute, 1971, p 541-544. 10 ref.

Descriptors: Water pollution control, Oil, Water pollution sources, *Oily water, *Federal government, *State governments, Water pollution treatment, Interagency cooperation, Government finance, Local governments, Oil wastes.
Identifiers: *Oil spills, *Contingency planning, *Oil spill cleanup.

With the policy of the Federal Government to respond generally to oil and hazardous material spills beyond the response capability of state and local governments, it has become necessary for the Fifty States and other governmental units to initiate measures whereby Strike Forces can be deployed by the states to contain and recover the numerous minor oil and hazardous material spills that increasingly occur. Since the states and local governments provide police and fire protection for their citizens, they are now being asked to furnish a capable team of trained personnel with necessary equipment to safeguard the environment from oil and hazardous material spills. The states and local governments are increasingly being burdened with fiscal responsibilities in excess of revenues for the services they provide their citizens. This could be one area where the Federal Government could work in partnership with the state and local governments by providing financial assistance. (See also W71-12588) (Misra-PAI)
W71-13094

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

FITTING METHODS FOR CONCEPTUAL CATCHMENT MODELS,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W71-12257

RUNOFF EVALUATION AND STREAMFLOW SIMULATION BY COMPUTER,
Corps of Engineers, Portland, Oreg.
For primary bibliographic entry see Field 02E.
W71-12289

NEW CONCEPT FOR MANAGING AQUATIC LIFE SYSTEMS,
Virginia Polytechnic Institute and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 06B.
W71-12305

STOCHASTIC OPTIMIZATION AND SIMULATION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS (VOLUME I), INTRODUCTION.
Texas Water Development Board, Austin, Texas; and Water Resources Engineers, Inc., Walnut Creek, Calif.

Available from the National Technical Information Service as PB-202 937, $3.00 in paper copy, $0.95 in microfiche. Texas Water Development Board Report No 131, July 1971. 129 p, 63 fig, 17 tab, 23 ref. OWRR Project C-1681 (No 3156) (1).

Descriptors: *Planning, Water resources development, *Optimum development plans, Model studies, *Stochastic hydrology, Management, *Operations research, *Systems analysis, Networks, *Simulation analysis, *Optimization, Linear programming, Sampling.

This research product defines a methodology for finding an optimal (most reasonable) staging plan for implementing a multibasin water resource system--a system that must meet, with an optimal level of shortages, prespecified but highly variable demands for water that increase over time--a system such as the proposed Texas Water System. The methodology explicity evaluates the impact that stochastic variability of the meteorologic variables and uncertainty in the remaining variables have on determining (1) which of an over-specified set of reservoirs and pump-canals should be constructed, (2) how large each of the reservoirs and pump-canals should be at various points on the demand build-up curve, and (3) how the resulting optimized system should be operated both during and after the period in which facilities are being added or increased in size, to minimize the present worth of their construction costs, expected operation costs, and expected penalty costs incurred for demands not met. The methodology is designed to analyze a problem on a monthly basis using historical or stochastic hydrologic input data sequences, a specified demand build-up period, and an economic life as identified by the user. (See also W71-12326 and W71-12327) (Weiss-TWDB)
W71-12325

STOCHASTIC OPTIMIZATION AND SIMULATION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS (VOLUME II), (PROGRAM DESCRIPTIONS).
Texas Water Development Board, Austin, Texas; and Water Resources Engineers, Inc., Walnut Creek, Calif.

Available from the National Technical Information Service as PB-202 938, $6.00 paper copy, $0.95 in microfiche. December 1970, (IIA-118p; IIB-87p; IIC-99p; IID-53p; IIE-101p; IIF-69p). OWRR Project C-1681 (No 3156) (1).

Descriptors: *Planning, Water resources development, Optimum development plans, Model studies, Stochastic hydrology, *Operations research, Systems analysis, Network, Simulation, Optimization, *Linear programming, Sampling, Management, *Computer programs.

The computer programs developed during this research are designed to analyze a problem on a monthly basis using historic or stochastic hydrologic input data sequences, a specified demand build-up period, and an economic life as defined by the user. This research is documented in the following separate reports comprising volume II: Volume IIA - SIM-III Program Description; Volume IIB - FIL-LIN-I Program Description; Volume IIC - AL-II Program Description; Volume IID - DEMAND-II Program Description; Volume IIE - SEQUEN-I Program Description; and Volume IIF - CAPEX-I Program Description. (See also W71-12325 and W71-12327)
W71-12326

STOCHASTIC OPTIMIZATION AND SIMULATION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS (VOLUME III), DATA MANAGEMENT AND ANALYSIS PROGRAM DESCRIPTION.
Texas Water Development Board, Austin, Texas; and Water Resources Engineers, Inc., Walnut Creek, Calif.

Available from the National Technical Information Service as PB-202 939, $3.00 in paper copy, $0.95 in microfiche. December 1970. 150 p. OWRR Project C-1681 (No 3156) (1).

Descriptors: *Planning, Water resources development, Optimum development plans, Model studies, Stochastic hydrology, *Operations research, Systems analysis, Network, Simulation, Optimization, Linear programming, Sampling, *Management, *Computer programs.

The programs documented here represent the majority of those computational and data management routines necessary to develop the modeling input tapes used as input to the SIM-III and AL-II programs. The first three programs contained herein, CURFIT-II TAPEWRITE-III, and PORT-GEN-II are improved versions of the comparable programs used in last year's research and documented in Volume III of 'Systems Simulation for Management of a Total Water Resource,' (See W70-09516). The fourth program, SETUP-I, is a new program developed primarily to manipulate and analyze the stochastic data sequences involved in this year's research activity. Because of the complexity of the problem being analyzed and the limited time span in which to accomplish the research, this program is somewhat problem specific. However, because of the nature of the set of routines and the manner in which they were programmed, only minor programming changes need to be made in order to permit this set of procedures to be applied to other similar problems. (See also W71-12325 and W71-12326)
W71-12327

IRRIGATION WATER VALUES IN PORTIONS OF WYOMING'S TONGUE AND POWDER RIVER BASINS: A BUDGETING AND LINEAR PROGRAMMING ANALYSIS,
Wyoming Univ., Laramie. Div. of Agricultural Economics.
James R. Owen.
MS thesis, 1971. 204 p, 16 fig, 64 tab, 56 ref, 5 append. OWRR Project A-001-WYO (39).

Descriptors: *Linear programming, *Irrigation water, *Budgeting, *Water values, *Demand schedule, Cost allocation, Water costs, Wyoming, Average costs, Marginal costs, Marginal productivity, Economic efficiency, Water demand, Demand prices, Flood irrigation, Land classification, Irrigation efficiency, Supplemental irrigation, Water allocation (Policy), Irrigation management, Methodology, Analytical techniques, Data collections, Sprinkler irrigation, Livestock, Crops, Agricultural watersheds, Model studies.
Identifiers: Shadow prices, Parametric programming, Tongue River basin (Wyo),owder River basin (Wyo), Clear Creek basin (Wyo), Demand curve, Consumptive irrigation, Marginal value product.

Budgeting and linear programming are used to estimate values of irrigation water. Using a random sample of ranchers in the Tongue, Clear Creek, and Powder River Basins (Wyoming), interviews were conducted to determine data for each of their crop and livestock operations. This data was linearly programmed to maximize returns on this variable set of crops and livestock, with the amount of irrigation water kept constant. The amounts of irrigation water were then varied by parametric programming to establish a demand curve of prices that ranchers would be willing to pay for different amounts of supplemental irrigation water in the three basins. These 'shadow prices,' though not marginal value products in the strictest sense, can give water management authorities an indication of prices that could be charged to profit maximizing ranchers for supplemental irrigation water. A detailed explanation and description of the methodology of and analytical framework used in this study is included. This paper contains 56 references. (Wade-Wisconsin)
W71-12335

CHAPTER 5. USE OF COMPUTER TECHNOLOGY TO DEVELOP MATHEMATICAL MODELS FOR NATURAL BODIES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 02A.
W71-12352

BEHAVIOR OF WATER IN A SOUTHWESTERN IMPOUNDMENT,
Oklahoma Univ., Norman. School of Engineering and Environmental Science.
For primary bibliographic entry see Field 02H.
W71-12422

ANALYTICAL RELATIONS IN THE TIME FREQUENCY OF THE TOTAL RIVER RUNOFF AND ITS GENETIC COMPONENTS,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
For primary bibliographic entry see Field 02E.
W71-12424

EVALUATION OF A DIGITAL CATCHMENT MODEL ON NEW ZEALAND CATCHMENTS,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W71-12431

DESIGNING RESERVOIRS WITH SHORT STREAMFLOW RECORDS,
Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 08A.
W71-12451

IDENTIFICATION OF MATHEMATICAL MODELS FOR DO AND BOD CONCENTRATIONS IN POLLUTED STREAMS FROM NOISE CORRUPTED MEASUREMENTS,
Purdue Univ., Lafayette, Ind. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 05B.
W71-12452

A NOTE ON THE USE OF MARKOV CHAINS IN HYDROLOGY,
Lancaster Univ. Bailrigg (England). Dept. of Mathematics.
For primary bibliographic entry see Field 04A.
W71-12461

EVALUATION OF THE WORTH OF ADDITIONAL DATA,
Arizona Univ., Tucson. Systems Engineering and Hydrology.
For primary bibliographic entry see Field 07C.
W71-12604

DISPERSION COMPUTATION AND TEMPERATURE SIMULATION FOR THE CONNECTICUT RIVER ESTUARY BY MATHEMATICAL MODEL,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 05B.
W71-12673

A DIMENSIONLESS PARAMETER STUDY OF GROUNDWATER RECHARGE IN OKLAHOMA,
Oklahoma Univ. Research Inst., Norman.
For primary bibliographic entry see Field 02F.
W71-12697

A DISPERSION MODEL FOR A QUANTITATIVE STUDY OF A GROUNDWATER POLLUTION BY SALT,
National School of the Bridges and Roads, Paris (France).
For primary bibliographic entry see Field 05B.
W71-12798

USE OF THE METHOD OF STOCHASTIC APPROXIMATIONS FOR ESTIMATING THE PARAMETERS OF PROGNOSTIC EQUATIONS,
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leninggrad (USSR).
M. S. Fuks-Rabinovich.
Soviet Hydrology: Selected Papers, No 1, p4-7, 1970. 6 ref. Translated from Trudy GMTs, No 54, p 81-85, 1970.

Descriptors: *Stochastic processes, *Numerical analysis, *Statistical methods, *Estimating, Synthetic hydrology, Simulation analysis, Mathematical studies, Parametric hydrology.
Identifiers: Stochastic approximation, USSR.

The system of prognostic equations used in the numerical difference method of solution includes several parameters whose accuracy largely determines the results of the computations. These parameters can be both physical and mathematical and it is difficult to determine them a priori because of the character of the prognostic fields. The method of stochastic approximations can be used to estimate the unknown parameters. This method makes it possible to obtain optimum estimates of the parameters on the basis of a small number of observations. (Knapp-USGS).
W71-12814

COMPUTER ANALYSIS OF FLOW TOWARD ARTESIAN WELLS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W71-12841

6B. Evaluation Process

THE OUTLOOK FOR WATER-QUALITY, QUANTITY, AND NATIONAL GROWTH,
Resources for the Future, Inc., Washington, D.C.
N. Wollman, and G. W. Bonem.
The Johns Hopkins Press, Baltimore, Md., 1971. 286 p.

Descriptors: Water resources development, *Reviews, *Water demand, *Water supply, *Water quality, Water pollution control, Water yield, Water users, Forecasting, Surveys, Future planning (Projects).

A systematic economic model for a national water perspective based on regional analyses is constructed. The water supply is calculated at several levels of dependable flow achieved by reservoir regulation for each of twenty-two water resource regions. Regional requirements are projected to the year 2020 based on high, low, and medium estimates of population and economic growth. Three alternative programs are developed for meeting indicated regional shortages: minimum treatment, minimum storage, and minimum cost. Both water quality and quantity are emphasized. By comparing the impact on policy of alternative quality goals, it is shown how aesthetic judgments can be incorporated into an economic analysis of water resources. (Woodard-USGS)
W71-12283

NEW CONCEPT FOR MANAGING AQUATIC LIFE SYSTEMS,
Virginia Polytechnic Institute and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr.
Journal Water Pollution Control Federation, Vol 42, No 1, p 77-82, January 1970. 12 ref.

Descriptors: *Evaluation, *Water pollution effects, *Water pollution control, *Bioassay, *Bioindicators, *Regulation, *Management, *Water policy, Environmental effects, Environmental sanitation, Pollution abatement, Public health, Water allocation (Policy), Water resources, Standards, Warning systems, Water utilization.
Identifiers: *Environmental management, *Survival, *Human survival, Environmental quality control, Recommendations.

Contemporary environmental facts require a new approach for making full use of natural ecosystems without damaging them. Such an approach would include: (1) prediction systems involving development of improved bioassay techniques, (2) simulation techniques using scale and statistical models, (3) biological information systems for monitoring receiving water condition, (4) aquiculture techniques for utilization of those aquatic systems deemed impossible to restore, and (5) identification and consideration of environmental life support functions and their requisite components. Our response to environmental problems has hitherto been almost entirely defensive, and rather than responding primarily to threats, we should be planning constructive management. (LeGore-Washington)
W71-12305

THE FEASIBILITY OF CENTRALIZED MANAGEMENT OF WATER RECREATION FACILITIES IN MISSISSIPPI,
Mississippi State Univ., State College. Water Resources Research Inst.
D. C. Williams, Jr., C. P. Cartee, and M. H. Malchow.
Available from the National Technical Information Service as PB-202 667, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Mississippi Water Resources Research Institute, State College, August, 1971. 74 p, 5 fig, 11 tab, 10 ref. OWRR Project A-041-MISS (1).

Descriptors: *Management, *Recreation, *Parks, Mississippi, Recreation facilities, *Federal government, *State governments, Organizations, Institutions, Inter-agency cooperation.

The purpose was to evaluate the feasibility of centralized management of public water-based recreation facilities constructed by federal and state agencies in Mississippi. Six state and three federal agencies are primarily involved. Management of recreation facilities is the major function of only one agency--the State Park System. Intensity of development, level of operation and maintenance, etc., are almost of the same number as there are agencies involved. Also, management philosophies and practices vary among the agencies. Some charge entrance and/or user fees and others do not, and the nature and level of funding are diverse. Based upon interviews with representatives of each agency, analysis of available data, review of agency organization and functions, and a survey of management practices used in other states, it was concluded that centralized management is feasible in Mississippi. The two major advantages that seem apparent are greater overall efficiency in management and better use of resources allocated to recreation. As a way to achieve centralized management; it was suggested that a State Department of Conservation, recommended by a recent Task Force on Government Efficiency and Economy, be established in modified form to bring all of the concerned state agencies under its jurisdiction. Centralized management seems feasible and should result in greater recreation use and satisfaction with a given level of resources allocated for facility development and management.
W71-12322

RECONNAISANCE STUDY FINANCE, ORGANIZATION, MANAGEMENT NASHUA RIVER WATER QUALITY DEMONSTRATION PROGRAM,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 05G.
W71-12332

THE ECONOMICS OF WATER SUPPLY AND QUALITY,
Harvard Univ., Cambridge, Mass. Harvard Water Program.
For primary bibliographic entry see Field 05G.
W71-12333

AN ANALYSIS OF THE USER RATES OF AND PREFERENCES FOR THE WATER-BASED RECREATION RESOURCES AT LAKE MACBRIDE STATE PARK IN THE SUMMER OF 1970,
Iowa Univ., Iowa City. Recreation Education Program.
J. J. Born.
MA thesis Iowa University, Recreation Education Program, 1971. 199 p, 1 fig, 44 tab, 30 ref, 4 append. OWRR Project B-017-IA (1).

Descriptors: *Planning, *Use rates, *Water demand, *Recreation demand, Attitudes, Aesthetics, Scenery, Recreation, Fishing, Access routes, Boating, Campsites, Camping, Parks, Scuba diving, Data collections, Sport fishing, Water skiing, Surveys, Pricing, Recreation facilities, Water rates, Water values, Social aspects, Social participation, Cost allocation.
Identifiers: *User rates, *User preferences, *Water-based recreation, Lake Macbride State Park (Iowa), Fees, Charges.

Personal interviews were conducted to determine user rates of and preferences for the water-based outdoor recreation facilities at Lake Macbride State Park, Iowa. Interviewers attempted to determine present use of water-based recreation facilities, socioeconomic variables, visitor opinion toward changes in policies, services and facilities, monetary values placed on water recreation areas and facilities, and the upper limits of cost visitors would be willing to pay for facilities. The study indicates that younger respondents were of higher educational and occupational levels than older respondents and that time rather than cost was the limiting factor in the length of stay and number of visits--two factors which have implications for future user preferences. Most respondents were short term visitors. The primary attraction for the visitor appears to be the prominent physical feature of the area. Some visitors were willing to pay additional fees for facilities or services. It is recommended that studies be conducted at regular intervals to determine the interests and needs of participants and provide a rationale for fee charges and increases. There is a detailed discussion of interview procedures and data analysis. (Wade-Wisconsin)
W71-12334

UNIQUE ROLE OF WATER IN A DEVELOPING ECONOMY,
Denver Univ., Colo. Dept. of Geography and Regional Development; and Tipton and Kalmbach, Inc., Denver, Colo. Planning Div.
C. N. Crain, and D. W. Grennman.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 95, No IR1, p 79-90, 1969. 13 ref.

Descriptors: *Water resources development, *Economic impact, *Agriculture, Social impact, Human population, Productivity, Capital supply, Irrigation.
Identifiers: *Economic development, *Economic 'take off', West Pakistan, Indus Plain (W Pakistan), Near East, South Asia, South America.

In most developing economies water is in competition with other resources for development capital and commonly earns a relatively low priority compared to industrial development. This derives from a mistaken tendency of economists to equate industrialization with economic development whereas, in fact, industrialization is commonly a product of the economic development of the primary agricultural sectors which can supply surplus capital for economic 'take off.' The exploitation of primary water resources is the first step in the development of this agricultural sector. In West Pakistan it can be demonstrated that only a small fraction of the population can be affected by industrial and urban developments until the agricultural sector is fully developed; a massive water resources development plan has been undertaken to supply irrigation water for the Indus Plain. When the program of works is completed by 1980, virtually all the water resources of the Indus Basin will be developed for useful purposes with 85% of West Pakistan's population benefiting directly. (Wade-Wisconsin)
W71-12339

SOME ECONOMIC ASPECTS OF WATER QUALITY ENHANCEMENT,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
For primary bibliographic entry see Field 05G.
W71-12340

ECONOMIC IMPACT OF POLLUTION ABATEMENT,
Federal Reserve System, Washington, D.C. Board of Governors.
For primary bibliographic entry see Field 05G.
W71-12341

TECHNOLOGICAL EXTERNALITIES, OUTDOOR RECREATION, AND THE REGIONAL ECONOMIC IMPACT OF CAYUGA LAKE,
New York State Coll. of Agriculture, Ithaca. Dept. of Agricultural Economics.
T. H. Stevens, and R. J. Kalter.
New York State College of Agriculture, Ithaca. Dept. of Agricultural Economics Res 317, 1970. 39 p, 16 tab, 30 ref. OWRR Project B-014-NY (1).

Descriptors: *Environmental effects, *Regional analysis, *Economic prediction, *Recreation de-

mand, Forecasting, Estimated benefits, Use rates, Economic impact, Direct benefits, Indirect benefits, Value, Pricing, Demand schedules (Recreation), Methodology, Boating, Fishing, Water pollution effects.
Identifiers: *Cayuga Lake (NY), *Technological externalities, *Adverse effects, Regional impact, Conflicting uses.

This report attempts to predict the economic value of Cayuga Lake, New York, and the regional impact of technological externalities. The value of Cayuga Lake to those who use it as a recreational resource was determined by a calculation of consumer willingness to pay for lake recreation using empirically determined demand functions. The regional economic impact of the lake as a result of recreation expenditures by persons outside the area was assessed by the use of a regional multiplier. Both willingness to pay for lake recreation and regional impact of the lake were projected for 1970 and 1985. An accurate prediction of possible externality effects of thermal pollution from a proposed atomic power station on the lake would entail an accurate estimate of various threshold levels of thermal pollution required to bring about reductions in recreation demand. No data has been developed to estimate these threshold levels, but given a 25% decrease in the 1985 demand for boating, regional employment would be reduced by 8.5 man-years, sales would be decreased by $123,000 and consumer willingness to pay values would be decreased $125,000, a 25% decrease in each of these categories. (See also W71-12343 and W71-12344) (Wade-Wisconsin)
W71-12342

RECREATION DEMAND FUNCTIONS AND THE IDENTIFICATION PROBLEM,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Economics.
Robert J. Kalter, and Lois E. Gosse.
Journal of Leisure Research, Vol 2, No 1, p 43-53, 1970. 2 fig, 20 ref. OWRR Project B-014-NY (1).

Descriptors: *Recreation demand, *Estimating, *Elasticity of demand, *Equations, Use rates, Prices, Costs, Investment, Model studies, Value, Cost repayment, Economic impact.
Identifiers: *Identification problem, *Transfer costs, *Supply effects, *Demand effects, Reduced form demand equations, Structural demand equations, Cross sectional analysis.

The identification problem or the separation of supply effects from demand effect, which arises in estimating recreational demand functions is discussed. The use of structural demand equations rather than reduced form equations and user response models is stressed. It is suggested that a traditional market type demand equation be estimated for each recreational activity rather than one which is set specifically. A model using cross-sectional data is suggested as a solution to the problem because activity prices include 'transfer cost' such as transportation, tolls, time, etc., and regional variation in supply can be used with cross-sectional analysis as a supply shifter to help identify demand functions. (See also W71-12342 and W71-12344) (Wade-Wisconsin)
W71-12343

USER RESPONSE IN OUTDOOR RECREATION: A COMMENT,
Cornell Univ., Ithaca, N.Y. Dept. of Economics; and Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Economics.
L. E. Gosse.
Journal of Leisure Research, Vol 2, No 2, p 131-134, 1970. 2 fig, 1 ref. OWRR Project B-014-NY (1).

Descriptors: *Value, *Recreation demand, *Recreation facilities, Use rates, Costs, Decision making.
Identifiers: Production functions.

'User Response in Outdoor Recreation: A Production Analysis' by J J Seneca and C J Cicchetti (Journal of Leisure Research, Vol 1 No 3, 1969), is criticized. There 'is a question as to whether their production function for recreation sites' estimates capacity or use of a recreational site. If it is an estimate of capacity, the equation will be an underestimation of the production function because the coefficients are derived using a sample rather than potential visitation. If it is an estimate of use it fails to incorporate the cost component of supply. The supply of facilities available to a given population is dependent on costs such as travel time, travel expenses, or entrance fees. The supply curve slopes, with larger quantities supplied costing more; thus rather than an increase in supply necessarily resulting in a proportional increase in use, an increase in recreation supply at a distant point may not result in increased use. The basic inadequacy of the 'user-response model' is that generally only public decision-makers are interested in predictions of increased use of recreational sites generated by addition of new facilities as justification for allocating funds among competing uses. Value, together with the amount, of new participation is necessary for investment decisions. (See also W71-12342 and W71-12343) (Wade-Wisconsin)
W71-12344

ECONOMICS OF WASTEWATER TREATMENT,
Texas Univ., Austin. Dept. of Civil Engineering; and Engineering Science of Texas, Inc., Austin.
For primary bibliographic entry see Field 05D.
W71-12345

WATER AND WATER POLLUTION HANDBOOK, VOLUME 1.
For primary bibliographic entry see Field 02A.
W71-12347

WATER AND WATER POLLUTION HANDBOOK, VOLUME 2.
For primary bibliographic entry see Field 02A.
W71-12355

ARTIFICIAL RECHARGE INVESTIGATIONS BY THE WATER RESOURCES BOARD,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 04B.
W71-12416

BRIGHT, BREATHING EDGES OF CITY LIFE PLANNING FOR AMENITY BENEFITS OF URBAN WATER RESOURCES,
Moore (Arthur Colton) Associates, Washington, D.C.
Arthur C. Moore, and Pierre P. Childs.
Available from the National Technical Information Service as PB-202 880, $3.00 in paper copy, $0.95 in microfiche. Completion Report July 15, 1971. 281 p, 59 fig, 64 ref, 6 append. OWRR Project C-2141 (No. 3369) (1).

Descriptors: *City planning, *Water resources development, *Area redevelopment, *Project planning, *Attitudes, *Creativity, Urbanization, Human population, Competing uses, Obsolescence, Rehabilitation, Administrative agencies, Recreation, Transportation, Design, Aesthetics, Economic impact, Legal aspects, Political aspects, Social aspects.
Identifiers: *Waterfront conversion, *Planning experiences, Waterfront problems, Initiative, Critical factors, Planning process, Amenities, Innovations, Washington, Boston, Buffalo, Oakland, New Orleans, Louisville.

Case studies of the experience of six cities in planning and converting their deteriorated downtown waterfronts to amenity uses are presented and compared. Through analysis, problem constants are developed and critical factors isolated. From this, a prototypical planning process is derived to serve as a guide in structuring planning strategies for similar waterfront conversions. Planning innovations developed in the case studies are evaluated and physical innovations are proposed as a response to problem conditions typical of urban waterfronts.
W71-12687

INSTITUTIONAL ASPECTS OF WATER RESOURCES DEVELOPMENT - A BIBLIOGRAPHY.
Water Resources Scientific Information Center, Washington, D.C.

Available from the National Technical Information Service as PB-202 862, $3.00 in paper copy, $0.95 in microfiche. WRSIC-71-210, September, 1971. 287 p, 255 ref.

Descriptors: *Institutions, *Planning, *Management, *Water policy, *Bibliographies, *Abstracts, Data storage and retrieval, Publications, Documentation, Classification, Water resources development, Legal aspects, Economics, Evaluation.

This bibliography was retrieved from Selected Water Resources Abstracts, published through September 1, 1971 (Volume 4, No. 17), by Water Resources Scientific Information Center, of the Office of Water Resources Research, U.S. Department of the Interior. The publication contains 255 abstracts. Each bibliography entry includes title, author, source, descriptors, identifiers, abstract, and accession number. A permuted keywork-in-title index precedes the bibliography.
W71-12688

TECHNIQUES FOR MEASURING PUBLIC EVALUATION OF RECREATIONAL VS. HYDROELECTRIC WATER USE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
J. A. Ballweg.
Available from the National Technical Information Service as PB-202 855, $3.00 in paper copy, $0.95 in microfiche. Virginia Water Resources Research Center, Blacksburg, Completion Report, August 1971. 14 p, 2 ref. OWRR A-038-VA (1).

Descriptors: *Attitudes, *Social values, *Recreation demand, *Hydroelectric power, Virginia, *Recreation, Evaluation, *Water utilization, *Competing uses, *Water demand.
Identifiers: *Recreation vs. hydroelectric power, Roanoke (Va).

Two techniques were employed to assess public attitudes toward use of water resources for hydroelectric and recreational purposes. A sample of 309 households in Roanoke, Va., selected by the cluster technique, were interviewed in their homes. On the general question of water use, employing a Likert scale, it was found that respondents with higher occupational positions and educational attainment were more negative toward water related questions than persons at the opposite end of the occupational and educational continuum. It was also found that younger respondents were more negative than older respondents. The Likert scale produced a reliability coefficient of 0.538. An eight-item Semantic Differential scale was developed to assess intensity of feeling toward recreational use of water compared to hydroelectric use. The scales produced a reliability coefficient of 0.84 for the recreational statement and 0.87 for the statement dealing with power. The techniques appear to provide approaches for explorations into characteristics associated with positive and negative attitudes toward various uses of water resources. The techniques could provide guidelines in attempts to gain support for water development and reclamation projects
W71-12694

GUIDE LINES FOR NEVADA WATER PLANNING.
Nevada Div. of Water Resources, Carson City.

Water for Nevada, State of Nevada Water Planning Report No 1, 9 p, January 1971. 3 fig.

Descriptors: *Nevada, *Planning, *Area development, *Economic efficiency, *Water resources development, Economic feasibility, Future planning (Projected), Long-term planning, Census, Forecasting, Water allocation (Policy), Arid lands, Social function, Programs.

Improvements in Nevada's economy cannot be separated from utilization of her water resources. The complexity of the problem and importance of cooperation with other western states necessitated the development of a State Water Plan which will analyze and coordinate those elements affecting water and related land resources. The 1969 Nevada Legislature authorized a State Water Planning Program and appropriated funds to the Division of Water Resources. This paper outlines the basic objectives of the Plan and guiding principles through the systematic approach steps. There are 3 basic planning objectives: (1) environmental quality; (2) economic efficiency; and (3) area development. The guiding principles relate to existing water rights and quality standards, state hydrographic divisions, utilization of new technical advances and the time span covered by the plan. Assumptions relative to the state and national economy are outlined. Plan formulation involves data collection and evaluation in the following steps: resource inventories, need projections, calculation of residual needs, formulation of alternate plans, selection of a specific plan. (Casey-Arizona)
W71-12742

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE WATER QUALITY CONTROVERSY IN MINNESOTA AND THE MARGINAL COSTS OF ALTERNATIVE LEVELS OF WATER QUALITY IN THE UPPER MISSISSIPPI RIVER,
Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 05G.
W71-12331

WATER AS A CONSUMER COMMODITY,
R. Tinney, and J. O'Riordan.
Journal of Soil and Water Conservation, p 103-106, May-June 1971. 22 ref.

Descriptors: *Elasticity of demand, *Water values, *Economic efficiency, *Pricing, Water rates, Marginal costs, Average prices, Average cost, Resource allocation, Water costs, Welfare (Economics), Water law, Water allocation (Policy), Intangible benefits, Water demand, Decision making, Cost allocation, Administration, Equitable apportionment.
Identifiers: Pricing policies, External economies, Effluent fee, Pollution rights, Intangible benefits, System effects.

Increased use of pricing mechanisms as a means of allocating water resources is proposed and discussed. Because of fundamental market imperfections, water management has traditionally been within the public domain; this has led to water being underpriced in relation to its marginal use value, and the overexpansion and overinvestment in water supply facilities at the expense of other areas of public investment. Among pricing policies discussed are marginal cost pricing, which theoretically most efficiently allocates all resources; average cost pricing which just recovers project costs, 'effluent charges' which reduce water pollution by providing economic incentives for waste water producers to minimize their discharges; and 'pollution rights' which could be bought and sold on the market. The major problem of instituting a water pricing policy is insuring that social welfare objectives are not sacrificed for economic efficiency. Intangible and collective benefits such as flood control, recreation and preservation of unique ecological habitats must not be sacrificed. Demand elasticities must be determined to establish the future impact of pricing policies. Water law must be examined and refined to ensure that economic and social goals are achieved. (Wade-Wisconsin)
W71-12346

POLLUTION CONTROL AND THE BUDGET,
Illinois Environmental Protection Agency, Springfield.
For primary bibliographic entry see Field 05G.
W71-12731

6D. Water Demand

IRRIGATION WATER VALUES IN PORTIONS OF WYOMING'S TONGUE AND POWDER RIVER BASINS: A BUDGETING AND LINEAR PROGRAMMING ANALYSIS,
Wyoming Univ., Laramie. Div. of Agricultural Economics.
For primary bibliographic entry see Field 06A.
W71-12335

RECREATION DEMAND FUNCTIONS AND THE IDENTIFICATION PROBLEM,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06B.
W71-12343

WATER HAULING BY TRUCKS IN ILLINOIS,
Illinois State Water Survey, Urbana.
W. J. Roberts.
Illinois Water Survey Circular 106, 1971. 12 p, 3 fig, 1 tab, 5 ref.

Descriptors: *Water supply, *Water distribution (Applied), *Water shortage, *Water requirements, *Illinois, Water costs, Water utilization, Water users, Water demand, Water transfer.
Identifiers: *Water hauling (Ill), Water transport.

Water hauling is a year-round business for about 500 commercial truckers and a seasonal activity for nearly 6000 rural dwellers in Illinois. In 1970, 72 million gallons of treated water was purchased from municipal water plants and hauled an average distance of 10 miles for a variety of uses including livestock watering, agricultural applications, road construction, and swimming pools. In addition, about 500 truckers in the fertilizer industry brought 10 million gallons of treated water for solubilizing fertilizers and applying to cultivated fields. Information on annual sales of water to truckers, methods of vending, costs, and destination of the water was obtained from 448 water plants throughout Illinois through response to a questionnaire. Although minor in the total use of water, truck hauling of water has increased about 10 times in the last 15 years and has changed from a primarily drought-related activity to a more regular service. Much of the increase is attributed to growth in use of liquid fertilizers and in demand for water-using devices in rural homes. (Woodard-USGS)
W71-12584

TECHNIQUES FOR MEASURING PUBLIC EVALUATION OF RECREATIONAL VS. HYDROELECTRIC WATER USE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W71-12694

ESTIMATED WATER USE IN NEVADA.
Nevada Div. of Water Resources, Carson City.
Water for Nevada, State of Nevada Water Planning Report No 2, 32 p, January 1971. 16 tab, 10 ref.

Descriptors: *Nevada, *Withdrawal, *Water demand, *Water resources development, *Priorities, History, Arid lands, Water types, Water users, Estimating, Groundwater, Hydroelectric power, Surface waters, Recreation, Streams, Wells, Springs, Irrigation, Water consumption (excludes consumptive use), Non-consumptive use, Water loss, Competing uses, Conjunctive use, Industrial water.
Identifiers: *Hydrographic regions.

Total water withdrawal in Nevada has increased from 4.1 million acre-feet in 1950 to about 4.6 million ac-ft in 1969. Demand is continuing to boom because of a rapid population growth and continuing agricultural expansion. This study is one portion of the inventory phase of the State Water Plan. A detailed understanding of past water usage along with accurate estimates of current demand will facilitate projections of future state water requirements for different types of uses. The 3 principal sources of water in Nevada are streams, springs and wells. The major categories of use are irrigation, public supply, industrial, hydroelectric power and rural purposes. A brief sketch is given of Nevada history relative to water use. Current estimates of water use are then given for each of the use categories, including descriptions and data on the relevant hydrographic basins. Of the total 4.6 million ac-ft withdrawn in 1969, about 1 million ac-ft was for non-consumptive use, mainly hydroelectric power generation. Of the 3.6 million ac-ft remaining, about 1.7 million ac-ft was consumed. The rest was returned to natural sources where it was either reused or lost by evaporation. Between 1965-1969, rural use (livestock and domestic) decreased slightly, irrigation (the largest consumptive use) increased by less than 1% and hydroelectric power generation by 4%. By contrast, public supply soared by about 45% and self-supplied industrial use by about 25%. Detailed tables are included of water use data by counties and hydrographic regions. (Casey-Arizona)
W71-12743

THE ROLE OF WATER IN URBAN COMMUNITIES,
Capetown (South Africa).
S. S. Morris.
South African Journal of Science, Vol. 67, No. 3, p. 73-85, March 1971. 5 ref.

Descriptors: *Water conservation, *Municipal water, *Water quality, *Economic justification, *Planning, Semiarid climates, Water shortage, Water resources, Water reuse, Sewage effluents, Sewage treatment, Industrial water.
Identifiers: *South Africa.

The existence and economic development of cities have always been critically dependent on available water supplies. This fact is especially important to South Africa, a water-short, largely semiarid nation whose urban population has more than doubled since WWII, and now amounts to about 50% of the total population. This reflects the pattern of national growth which has been characterized by the transformation from a rural to an essentially urban and industrial economy. The water resources of the country have hitherto been developed primarily for irrigation, and no less than 83.5% of total national water consumption currently goes to agriculture. It is estimated that by the end of the century, agriculture will contribute no more than 6% of the GNP. It is therefore important that future national water resource planning and development be oriented toward urban and industrial needs. Expected urban water demand for an average normal city is analyzed in terms of domestic, industrial and commercial consumption, power generation, fire protection, recreation and transport. Problems of quality requirements for differing uses are discussed and supply of one or two standard qualities is proposed. Maximum utilization of existing resources must involve prevention of wastage and increased reuse. This, in turn, calls for effective

water regulations, a strong water authority, use of water meters and a realistic water pricing policy in terms of its economic value. Probably the only feasible large-scale intra-urban reuse is the purification of sewage effluents for human consumption. Five major objectives are postulated for the decades to come: (1) more efficient conservation of natural waters; (2) the extenxion of reuse procedures combining quality standards and treatment costs to the pattern of demand; (3) investigation of new water sources such as desalinization; (4) a sustained public education effort aimed at reducing demand; (5) comprehensive water resource planning in terms of a more logical allocation of resources. (Casey-Arizona)
W71-12749

6E. Water Law and Institutions

INTERNATIONAL PAPER CO. V BUSBY (DAMAGES TO DOWNSTREAM LANDOWNER CAUSED BY DUMPING OF PULP WASTES INTO RIVER).

182 F.2d 790-793 (5th Cir 1950).

Descriptors: *Louisiana, *Pulp and paper industry, *Water pollution effects, *Damages, Water pollution, Water pollution sources, Pollution abatement, Pollutants, Water pollution control, Pulp wastes, Industrial wastes, Rivers, Riparian rights, Waste disposal, Settling basins, Land tenure, Flood damage, Judicial decisions, Legal aspects, Fishkill, Odor, Cattle, Downstream.

Plaintiff landowner sued defendant paper manufacturing company for damages to his land incurred by reason of an overflow of polluted water from defendant's plant. Plaintiff contended that defendant periodically emptied its settling basins into a river, thereby swelling the river and overflowing plaintiff's land, causing damage to his land, cattle, and business and creating an obnoxious nuisance from dead fish and odors. Defendant contended that evidence was insufficient to prove any damages to plaintiff and that the damages awarded by a lower court were excessive. A jury verdict was returned for plaintiff. The trial court conditioned denial of defendant's motion for a new trial upon a remittitur of a part of the verdict. Plaintiff agreed to this. In affirming the lower court judgment for plaintiff, the United States Court of Appeals, Fifth Circuit, held that conflicting testimony as to permanent damage to the land created a mixed question of law and fact and was correctly submitted to the jury. The return of a part of the jury verdict was proper where the trial judge in his discretion held that the damages awarded were not supported by the facts. (Smiljanich-Florida)
W71-12248

OCEAN DUMPING. A NATIONAL POLICY.
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-12295

ANDERSON-PRICHARD PIPE LINE CORP V SAXTON (PIPE LINE OPERATOR'S LIABILITY FOR POLLUTING ADJACENT WATER SUPPLIES).

177 F2d 1006-1008 (10th Cir 1949).

Descriptors: *Pipelines, *Water pollution, *United States, *Oily water, Impaired water quality, Water pollution effects, Cattle, Water pollution, Oil wastes, Water pollution sources, Pollutants, Groundwater movement, Underseepage, Damages, Remedies, Judicial decisions, Legal aspects, Livestock, Water supply, Oil industry, Oil fields.

Plaintiff livestock owner instituted this action against defendant pipeline company to recover damages for the death and injury of livestock. Defendant owned a battery of oil tanks from which two pipelines led. These lines crossed plaintiff's land. One was a water line and the other was an oil line. The two pipelines ran within twenty feet of a slough on plaintiff's farm which accumulated surface water during rainy periods. Defendant conceded that during rainy periods an oily scum formed on the surface of the slough from which plaintiff's livestock drank. Plaintiff contended that the death and injury of his cattle, caused by the oil contaminated water, resulted from a leak in defendant's pipeline. The United States Court of Appeals for the Tenth Circuit held that where testimony establishes that oil pollution ceases after the repair of a pipeline and previously sick livestock improve in health there is sufficient evidence to support a finding of negligence on the part of a pipeline company. The judgment for plaintiff was affirmed on grounds that he had established a sufficient causal connection between his loss and defendant's activities. (Shelnut-Florida)
W71-12300

UNITED STATES V THE CATHERINE (LIABILITY OF VESSEL FOR DISCHARGE OF OIL RESULTING FROM AN UNAVOIDABLE ACCIDENT).
116 Fed Supp 668-670 (D Md 1953).

Descriptors: *Ships, *Water pollution sources, *Oil, *Accidents, United States, Navigable waters, Navigation, Water pollution control, Water pollution effects, Fuel, Oil wastes, Legislation, Water law, Legal aspects, Judicial decisions, Admiralty, Disasters, Remedies.
Identifiers: *Oil Pollution Act of 1924.

Plaintiff United States brought suit in admiralty against defendant vessel for violation of the Oil Pollution Act of 1924. The Act prohibits discharge of oil into navigable waters of the United States, except for emergency or unavoidable accident. While defendant vessel was bunkering oil, a valve was closed to pump oil into another tank. A rag had become lodged in the seat of the valve, which caused about twelve barrels of oil to flow onto the deck. About three barrels of oil flowed overboard. The federal district court observed that wilfulness or intent was unnecessary to violate the Act and that an overt act did not have to be proven to sustain a conviction. However, the court also observed that an unintended discharge was excused by the Act if resulting from an unavoidable accident. Testimony was given that the rag must have entered the valve from inside the tank, without negligence by defendant. Hence, the court found that the presence of the rag in the valve and the resulting leak and discharge were unavoidable accidents. The libel was dismissed. (Hart-Florida)
W71-12306

NATURAL RESOURCES.

Alaska Constitution art VIII, secs 1 thru 18.

Descriptors: *Land use, *Alaska, *Resource development, *Natural resources, Land resources, Legal aspects, Legislation, Eminent domain, Permits, Prior appropriation, Water rights, Navigable waters, Parks, Safe yield, Wildlife, Water resources development, Land development, Public rights, Fish, Mineralogy, Public lands, Public benefits.

Alaska's public policy is to encourage the settlement of its land and the development of its resources by making them available for maximum use consistent with the public interest. In this respect, the legislature shall provide for utilization of all the state's natural resources for the maximum benefit of the people. Wherever occurring in their natural state, fish, wildlife and waters are reserved to the people for common use. All replenishable natural resources of the state shall be developed on the sustained yield principle, subject to preferences among beneficial uses. The legislature may provide facilities and improvements to assure greater settlement of land and utilization of natural resources. Other provisions govern: (1) the establishment of special purpose sites such as parks; (2) sales, grants, and leases of public domain; (3) public notices before disposing of state land; (4) the establishment of mineral rights by location; (5) mineral leases and permits; and (6) eminent domain and private rights of way. Prior appropriation determines water rights. All persons are entitled to free access to navigable waters, and no exclusive fishing rights are allowed. (Gallagher-Florida)
W71-12312

THE FEASIBILITY OF CENTRALIZED MANAGEMENT OF WATER RECREATION FACILITIES IN MISSISSIPPI,
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W71-12322

ATLANTIC PIPE LINE CO V DREDGE PHILADELPHIA (LIABILITY FOR POLLUTION FROM RUPTURE IN SUBMERGED OIL PIPELINE).

247 F Supp 857-865 (ED Pa 1965).

Descriptors: *United States, *Pennsylvania, *Water pollution sources, *Pipelines, Water pollution, Oil, Dredging, Storage tanks, Leakage, Oily water, Navigable waters, Harbors, Admiralty, Water law, Legal aspects, Judicial decisions, Rivers and Harbors Act, Ships, Channel improvements, Water pollution control, Legislation, Damages, Oil industry.

This action in admiralty involved a refinery, a pipeline company, the United States, a dredging company, and the dredge in rem. The dredge, in deepening a river channel, had lowered a spud which punctured a submerged oil pipeline. The escaping oil polluted a United States naval basin, causing damage to vessels. The pipeline company sought damages for the ruptured line. The refinery sought to recover for the loss of the oil. The United States sought to recover for damages to the basin. The United States District Court, Eastern Division, Pennsylvania, held that under a Pennsylvania statute a pipeline company is absolutely liable for the escape of oil from a submerged pipeline. The court also ruled that the evidence established the pipeline rupture was produced by the spud being negligently dropped and that the refinery had been negligent in not checking the oil level in its storage tanks before opening valves to release oil into the pipeline. The refining company, the pipe line company, and the dredge owner were all held liable to the United States, while the dredge owner was held liable for one-half of the pipeline damages. (Rees-Florida)
W71-12336

A BILL TO REGULATE THE DISCHARGE OF WASTES IN TERRITORIAL AND INTERNATIONAL WATERS.
House Bill 1661, 92d Cong, 1st Sess (1971). 6 p.

Descriptors: *Oceans, *Waste dumps, *Waste disposal, *Permits, Continental shelf, Regulation, Marine animals, Ecosystems, Environmental effects, Ecology, Public health, Environmental sanitation, Administrative agencies, Water pollution, Water pollution control, Ultimate disposal, Leakage, Ships, Water pollution sources, Domestic wastes, Industrial wastes, Federal government, Legal aspects, Legislation.

Within United States ports, the loading of wastes for ocean dumping would be prohibited by this bill unless a permit is obtained from the Environmental Protection Agency and the Coast Guard is notified of the loading. A permit will be granted if the waste discharge will not damage the ecology of the marine environment. In granting a permit the administrator shall consider the effects on human

health and welfare and the marine ecosystem, taking into account the proposed location and the concentration and volume of the waste. No discharge is permitted between the Continental Shelf and the coast of the United States. The administrator may: (1) bar the dumping of any specific matter detrimental to the marine environment or human welfare, (2) designate ocean dumping sites, and (3) conduct surveillance and other enforcement activities. Each permit issued shall specify: (1) the amount and type of waste authorized to be loaded and discharged, (2) the exact coordinates of the discharge point and proposed route, and (3) provisions the administrator deems necessary to prevent accidental spillage. Any prior governmental authorization to pursue activities covered by the Act would be terminated. (Gallagher-Florida)
W71-12337

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT RELATING TO AREA ACID AND OTHER MINE WATER POLLUTION CONTROL DEMONSTRATIONS.
House Bill 598, 92d Cong, 1st Sess (1971). 3 p.

Descriptors: *Federal government, *Administration, *Water pollution control, *Acid mine water, Federal jurisdiction, State governments, State jurisdiction, Regulation, Water pollution treatment, Water pollution effects, Water pollution abatement, Water policy, Public rights, Waste water (Pollution), Mine acids, Industrial wastes, Mine drainage, Project planning, Legislation, Water resources development, Financing.

The Secretary of the Interior, in cooperation with other federal agencies, is authorized to enter into agreements with any state to carry out one or more projects which will demonstrate methods for the elimination or control, within all or part of a watershed or drainage area, of acid or other mine water pollution resulting from active or abandoned mines. Such projects shall demonstrate the engineering and economic feasibility and practicability of various abatement techniques which will contribute substantially to effective and practical methods of acid or other mine water pollution elimination or control. In selecting watershed or drainage areas the Secretary shall: (1) require feasibility studies; (2) give preference to areas which have the greatest public value for recreation, water supply, and other public uses; and (3) be satisfied that the area will not be affected adversely by the influx of acid or other mine pollution from nearby sources. The states are required to pay not less than 25 per centum of the project costs and must provide legal and practical protection to the project area to prevent any activities which will cause future acid or other mine water pollution. (Horwitz-Florida)
W71-12338

A BILL TO AMEND THE SMALL BUSINESS ACT TO ENCOURAGE THE DEVELOPMENT AND UTILIZATION OF NEW AND IMPROVED METHODS OF WASTE DISPOSAL AND POLLUTION CONTROL; TO ASSIST SMALL BUSINESS CONCERNS TO EFFECT CONVERSIONS REQUIRED TO MEET FEDERAL OR STATE POLLUTION CONTROL STANDARDS; AND FOR OTHER PURPOSES.
House Bill 651, 92d Cong, 1st Sess (1971). 3 p.

Descriptors: *Federal government, *Legislation, *Treatment facilities, *Government supports, Federal jurisdiction, Pollution abatement, Regulation, Administration, Legal aspects, Government finance, Standards, Water policy, Water resources development, Waste treatment, Water pollution, Planning, Industrial plants, Facilities, Environment.

The Administrator of the Small Business Administration shall require that any equipment, facilities, or machinery to be acquired with assistance from this agency be so designed as to prevent, control, or minimize environmental pollution which might otherwise result therefrom, in accordance with such standards as the Administrator shall prescribe after consultation with the appropriate governmental agencies. In processing applications the Administrator shall give priority to those applications which will further the development or utilization of new and improved methods of waste disposal or pollution control. The rate of interest for the Administration's share of any loan shall not exceed the average annual interest rate on all interest-bearing obligations of the United States at the end of the fiscal year next preceding the date of the loan plus one quarter of 1 per centum per annum. The Administrator shall also make such loans as are appropriate to assist any small business in effecting additions or alterations in its plant, facilities, or methods of operation to meet requirements for the prevention or control of environmental pollution imposed by federal or state law, if such concern would suffer substantial economic injury thereby. (Horwitz-Florida)
W71-12360

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1970.
For primary bibliographic entry see Field 09C.
W71-12369

INDUSTRIAL WATER POLLUTION ABATEMENT LOAN ACT OF 1970 (A BILL TO PROVIDE FINANCIAL ASSISTANCE FOR A WATER POLLUTION ABATEMENT PROGRAM FOR INDUSTRIAL WASTES).
House Bill 806, 92d Cong, 1st Sess (1971). 3 p.

Descriptors: *Federal government, *Treatment facilities, *Loans, *Administration, Federal jurisdiction, Administrative agencies, Regulation, Standards, Facilities, Waste treatment, Pollution abatement, Water pollution, Financing, Allotments, Government finance, Water quality, Water treatment.

The Administrator of the Environmental Protection Agency, through the Office of Water Quality, is authorized and directed to enter into contracts with private businesses for financial assistance in the form of loans to such parties for the construction of waste treatment facilities to be used by such parties and to make loans to such parties for such construction. For a business to qualify for such a loan the construction of the waste treatment facility must be required by either the federal or state governments, and the loan applicant must be unable to construct said waste treatment facility without financial assistance from the United States government. Also, the Office of Water Quality must certify the construction, operation and maintenance of such facility is consistent with a comprehensive plan approved by the Administrator for the abatement of water pollution. The bill authorizes an appropriation of $800,000,000 for these loans. (Horwitz-Florida)
W71-12372

ENVIRONMENTAL FINANCING ACT OF 1971 (A BILL TO ESTABLISH AN ENVIRONMENTAL FINANCING AUTHORITY TO ASSIST IN THE FINANCING OF WASTE TREATMENT FACILITIES, AND FOR OTHER PURPOSES).
House Bill 5970, 92d Cong, 1st Sess (1971). 11 p.

Descriptors: *Government finance, *Loans, *Treatment facilities, *Construction costs, Financing, Investment, Costs, Capital costs, Waste treatment, Water pollution, Water pollution control, State governments, Local governments, Federal government, Legislation, Legal aspects, Administrative agencies, Cost sharing, Sewage treatment.

To assist in the financing of waste treatment facilities, this bill would authorize the creation of an Environmental Financing Authority to assure that inability to borrow necessary funds on reasonable terms does not prevent any state or local government from constructing waste treatment works. The composition of the board of directors and procedures for appointment to the board are specified. The function of the Authority would be to make commitments to purchase obligations issued by state or local governments to finance the non-federal share of the cost of constructing waste treatment facilities. In making these commitments, the Authority would follow the guidelines for setting terms and conditions set forth in the bill. A maximum of $100,000,000 initial capital is authorized for the purposes of this section. Other provisions of the bill deal with: (1) obligations of the authority, (2) federal payments to the Authority, (3) general powers of the Authority, (4) exemption from federal and state taxation, (5) obligations of the Authority as lawful investments and security, (6) the preparation of obligations, (7) annual reports, and (8) obligations eligible for purchase by national banks. (Gallagher-Florida)
W71-12373

A BILL TO CONSOLIDATE WATER QUALITY MANAGEMENT AND POLLUTION CONTROL AUTHORITIES AND FUNCTIONS IN THE ENVIRONMENTAL PROTECTION AGENCY.
House Bill 654, 92d Cong, 1st Sess (1971). 2 p.

Descriptors: *Federal government, *Administrative agencies, *Legislation, *Water pollution control, Federal jurisdiction, Organizations, Administration, Pollution abatement, Water pollution, Regulation, Water quality, Water quality control, Standards, Waste water disposal, Waste water (Pollution), Waste water treatment, Legal aspects, Government finance, Grants, Financing.
Identifiers: *Environmental Protection Agency.

All authorities and functions in water quality management and pollution control, including but not limited to the making of grants or loans to projects for the collection, treatment, or disposal of wastes, severally vested in the head of any federal agency under the provisions of the Public Health Service Act, as amended, Reorganization Plan Numbered 2 of 1966, Housing and Urban Development Act of 1965, Consolidated Farmers Home Administration Act, as amended, Housing Amendments of 1955, Housing and Urban Development Act of 1965, Public Works and Economic Development Act of 1965, Appalachian Regional Development Act of 1965, or any other applicable law are hereby transferred to the Administrator of the Environmental Protection Agency. (Horwitz-Florida)
W71-12495

A BILL TO AMEND SECTION 12 OF THE FEDERAL WATER POLLUTION CONTROL ACT RELATING TO THE CONTROL OF HAZARDOUS POLLUTING SUBSTANCES.

House Bill 680, 92d Cong, 1st Sess (1971). 2 p.

Descriptors: *Federal government, *Standards, *Pollutant identification, *Legislation, Pollution abatement, Water pollution control, Water pollution sources, Regulation, Administration, Administrative agencies, Water pollution effects, Public health, Water quality, Navigable rivers, Coasts, Legal aspects, Operations, Water policy, Pollutants.

The Administrator of the Environmental Protection Agency shall publish, and revise when necessary, in the Federal Register a list designating those hazardous substances which, when discharged in any quantity into or upon the navigable waters of the United States or upon adjoining shorelines of the waters of the contiguous zone, present an imminent and substantial danger to the public health or welfare including, but not limited to, fish, shellfish, wildlife, shoreline, and beaches. Any person who discharges any listed substance into any of the above mentioned waters shall immediately notify the appropriate agency of United States of such discharge. Each day that such a discharge is not reported constitutes a violation punishable by a fine of not more than $50,000 for each violation. (Horwitz-Florida)
W71-12498

PROHIBITION, PENALTIES, AND REMEDIES FOR THE POLLUTION OF A CITY OR TOWNSHIP'S WATER SUPPLY.
Tennessee Code Ann secs 39-2906, 39-2907 (1956).

Descriptors: *Tennessee, *Water pollution control, *Industrial wastes, *Water supply, Water pollution sources, Water pollution, Water quality control, Industrial water, Legislation, Legal aspects, Judicial decisions, Remedies, Damages, Local governments, Pollution abatement, Water works, Municipal water, Cities, Adjudication procedure.
Identifiers: Injunction (Prohibitory).

It shall be a misdemeanor for any person to carry on any business; to erect or construct any slaughterhouse, hide house, boneyard, tanyard, or soap factory; to deposit any injurious matter, thing, or substance; or to do any other act or thing, in such a manner, or at such a place, as to injure or pollute the waters of any stream from which water is taken by means of waterworks to supply any town or city in this state. Any person violating such prohibitions shall be fined at the discretion of the jury. The court shall order the abatement of such a nuisance before the conviction is had. Each day that any such nuisance is continued shall constitute an additional offense. The person so offending shall be liable to the water company, or to other persons injured, for all damages resulting from such injury. (Shelnut-Florida)
W71-12558

SHORELAND DEVELOPMENT.

Vermont Stat. Ann. Tit. 10, secs. 1100 thru 1105 (Supp. 1971).

Descriptors: *Vermont, *Water pollution control, *Water resources development, *Administrative agencies, Water pollution, Water pollution sources, Administration, Administrative decisions, Regulation, Standards, Water utilization, Water resources, Non-structural alternatives, Competing uses, Water quality, Water quality control, State governments, Local governments, Cities, Optimum development, Plans, Water policy.

Vermont's policy under this statute is to study, establish policies, make plans, make rules, and authorize municipal shoreland zoning by-laws for development and protection of its water resources. Various definitions are supplied by the law. The Department of Water Resources shall make studies, establish policies, and plan for the efficient use, conservation, development and protection of the water resources. The Department shall also: (1) make recommendations to other agencies, (2) maintain information on water resources, and (3) serve as an information clearinghouse for citizens and local governments. A comprehensive plan for water resources development shall be made by the Department, based upon the classification of waters, for pollution control. The Water Resources Board may establish rules to regulate public waters and shorelands by defining uses for certain areas and regulating conduct in certain areas. In establishing rules, the Board shall consider: (1) size and depth of waters, (2) upland usage, (3) adaptable uses, and (4) availability of recreational uses in the area. Adoption of rules shall be considered at public hearing on a petition by ten freemen. the Department shall assist cities in establishing shoreland protection by-laws. Violation of the statute subjects the offender to fine or imprisonment. (Hart-Florida)
W71-12560

MEMBERSHIP OF RIVER BASIN COMMISSIONS,
R. M. Nixon.
Federal Register, Vol 36, No 150, p 14299 (August 1971). 1 p.

Descriptors: *River basin commissions, *Administrative agencies, *Water Resources Planning Act, *River basin development, River basins, Legislation, Water resources, Water resources development, Water conservation, Water quality, Water utilization, Federal government, Water supply.

In Executive Order 11613, the President has amended section 3 (2) of the following executive orders by adding 'Environmental Protection Agency' immediately after 'Department of Transportation': (1) order 11331, March 6, 1967, establishing the Pacific Northwest River Basins Commission; (2) order 11345, April 20, 1967, establishing the Great Lakes Basin Commission; (3) order 11359, June 20, 1967, establishing the Souris-Red-Rainy River Basins Commission; and (4) order 11371, September 6, 1967, establishing the New England River Basins Commission (as amended by order 11528, April 24, 1970). The Administrator of the Environmental Protection Agency shall appoint a member to each river basin commission to serve as the representative of that agency as soon as practicable after the date of issuance of this order. (Hart-Florida)
W71-12566

DISCLOSURES PERTAINING TO MATTERS INVOLVING THE ENVIRONMENT.
Securities and Exchange Commission, Washington, D.C.

Federal Register, Vol 36, No 146, p 13989 (July 1971). 1 p.

Descriptors: *Federal government, *Administrative agencies, *Water pollution control, *Judicial decisions, Regulation, Rivers and Harbors Act, Clean Air Act, Legislation, Environment, Ecology, Environmental effects, Water quality, Water quality control, Water pollution, Pollution abatement, Waste water (Pollution).
Identifiers: *Water Pollution Control Act.

The Securities and Exchange Commission requirements for describing a registrant's business include disclosure of significant capital outlays which may be necessitated by compliance with requirements of environmental quality legislation, and which may materially affect the earning power of the business or cause material changes in the registrant's business done or intended to be done. Furthermore, the Commission requires disclosure of legal proceedings arising, for example, under the Rivers and Harbors Act, Federal Water Pollution Control Act, or Clean Air Act, as well as other federal, state, or local laws regulating discharges of materials into the environment, or otherwise relating to the environment. If such litigation is pending or known to be contemplated, but disclosure is omitted on the ground of immateriality, the Division of Corporation Finance will request the registrant to furnish supplemental information, including: (1) a description of the omitted information, and (2) a statement of the reason for its omission. (Hart-Florida)
W71-12581

OIL VERSUS OTHER HAZARDOUS SUBSTANCES,
Environmental Protection Agency, Washington, D.C. Water Quality Office.
For primary bibliographic entry see Field 05G.
W71-12591

INHABITANTS OF TOWN OF PITTSFIELD V CIANCHETTE (ACQUIRING PRESCRIPTIVE RIGHT TO MILL POND LEVEL BY DISCHARGING SEWAGE INTO THE POND).

279 A.2d 527-529 (Me 1971).

Descriptors: *Maine, *Sewage disposal, *Dams, *Prescriptive rights, Cities, Sewage, Ponds, Mill dams, Gates, Ponding, Streams, Local governments, Municipal wastes, Wastes, Disposal, Waste disposal.

Plaintiff municipality sought to enjoin defendant dam owner from opening the dam gates. Plaintiff discharged its sewage through three sewage lines into the mill pond formed by the dam. The sewage was then washed downstream. This situation had continued for over 50 years. Plaintiff contended it had acquired a prescriptive right to have the mill pond maintained. The Maine Supreme Court, however, noted that plaintiff had not interfered with defendant's rights at any time by discharging the sewage into the pond. Thus, it concluded that defendant could never have maintained an action against plaintiff, and therefore plaintiff had acquired no prescriptive right to the mill pond level. That is, plaintiff's actions were not adverse to defendant. For the same reasons, the court rejected plaintiff's argument that reciprocal easements had been created. (Hart-Florida)
W71-12605

CRITERIA FOR STATE, LOCAL AND REGIONAL OIL REMOVAL CONTINGENCY PLANS.
Environmental Protection Agency, Washington, D.C.

Federal Register, Vol 36, No 145, p 13918-13919 (July 1971). 2 p.

Descriptors: *Planning, *Disasters, *Oil, *Water pollution control, Water pollution, Water pollution treatment, Water pollution effects, Water pollution sources, Water quality, Water quality control, Federal government, State governments, Administrative agencies, Oil industry, Oil wastes, Pollution abatement, Pollutants, Accidents.

The Administrator of the Environmental Protection Agency has published guidelines to assist state, local, and regional agencies in developing oil removal contingency plans. After providing various definitions, the guidelines state that they establish minimum criteria for local contingency plans to insure coordinated effective action to minimize oil pollution damage, consistent with the National Oil and Hazardous Materials Pollution Contingency Plan. If the federal on-scene commander finds that proper action is being taken by the discharger or non-federal entities, he will monitor the operation and provide assistance as needed. If appropriate action is not being taken, the commander will assume control of the response activity. Criteria for development of contingency plans are: (1) clear definition of the authority, duties, and responsibilities of all involved personnel; (2) timely notification procedures; (3) provisions to assure knowledge of all resources and their full committment in a disaster; (4) provisions for specific actions to be taken upon discovery and notification of a discharge; and (5) specific procedures for recovery of damages and enforcement measures as provided by state and local law. For coordination, the plan should be developed in consultation with private interests, and a copy of the plan should be forwarded as requested to the Council on Environmental Quality. (Hart-Florida)
W71-12651

INSTITUTIONAL ASPECTS OF WATER RESOURCES DEVELOPMENT - A BIBLIOGRAPHY.
Water Resources Scientific Information Center, Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-12688

PERMITS FOR DISCHARGES OR DEPOSITS INTO NAVIGABLE WATERS.
Corps of Engineers, Washington, D.C.

Federal Register, Vol 36, No 144, p 13835-13837 (July 1971). 3 p.

Descriptors: *Permits, *Waste disposal, *Standards, *Discharge (Water), Federal government, State governments, Regulation, Water pollution

control, Water pollution, Waste water (Pollution), Water quality, Water quality control, Administrative agencies, Administrative decisions, Industrial wastes, Taxes, Legislation, Water Quality Act, Legal aspects, Pollutants, Pollution abatement, Water pollution effects, Water pollution sources.

General conditions with respect to all permits for discharges into navigable waters are: (1) all discharges shall be consistent with the permit and violation of the permit is unlawful, subjecting the permit to revocation; (2) all discharges shall be consistent with the highest applicable water standards; (3) if water quality standards are modified, all discharges must satisfy the new standards within six months; (4) each permittee must comply with Environmental Protection Agency regulations; (5) each permittee must permit inspection of its facilities and discharge operations; (6) records of the nature and frequency of discharges must be maintained; (7) if information in a permit application is found to be inaccurate, the permit is subject to revocation; (8) all permits, certificates, and records are subject to public inspection; (9) taxes and charges may be imposed on the permittee; (10) no property rights are conveyed, nor does the permit authorize invasion of property rights; (11) the permit does not authorize construction; (12) permits may not be assigned without consent; (13) if the discharge poses an imminent hazard to public health, it may be summarily revoked; (14) revocation for violation of the permit will be effective in 30 days; and (15) revocation will not support a claim for damages. Special conditions for a specific permittee may be listed in part II of the permit form. (Hart-Florida)
W71-12707

CONTROL OF HAZARDOUS POLLUTING SUBSTANCES.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-12708

DIVISION OF WATER POLLUTION CONTROL.

Massachusetts Ann Laws, ch. 21, secs. 26 thru 53 (Supp 1970) amending secs. 26 thru 50 (1967).

Descriptors: *Massachusetts, *Water pollution control, *Pollution abatement, Administrative agencies, Administrative decisions, State governments, Water pollution, Water pollution treatment, Treatment facilities, Water quality, Water quality control, Legal aspects, Legislation, Cities, Local governments, Oil, Oil industry, Waste disposal, Oil wastes, Sewage disposal, Permits.

The Massachusetts Clean Waters Act provides for a State Division of Water Pollution Control and various water pollution abatement districts. Comprehensive powers and duties are provided for both agencies. Towns and other local governments are also authorized to construct pollution abatement facilities. Provisions exist for: (1) approval of district abatement plan, (2) application for federal grants, (3) operation and maintenance of district facilities, (4) issuance of bonds and notes by districts, (5) research and demonstration projects and facilities, (6) a Clean Waters Scholarship Intern Program, (7) construction of reservoirs by the Water Resources Commission, and (8) entry into private property to investigate conditions relating to water pollution. A penalty is established for discharging wastes into state waters, and permits are required for sewage disposal outlets and new sewage systems. The Division has authority to operate sewerage systems and pollution abatement facilities. Upon giving notice of wrongful discharges, discontinuance may be ordered. Provisions exist for judicial review of the Director's decisions. Comprehensive requirements exist for petroleum transfers, including encircling booms, bond posting, and licensing of terminals. Requirements are also established for disposal of waste oil. (Hart-Florida)
W71-12717

DISCHARGE OF OILS INTO WATERS.
Massachusetts Ann Laws, ch 91, secs 59A, 59B (Supp 1970).

Descriptors: *Massachusetts, *Oil, *Marinas, *Sewage disposal, Boats, Rivers, Streams, Lakes, Inlets, Bays, Mosquitoes, Public health, Waste disposal, Legal aspects, Legislation, Regulation, Permits, Administrative agencies.

This section of the Massachusetts laws provides that any person who discharges petroleum or petroleum products into state waters, causing damage to private property, shall be liable to the property owner in an amount equal to twice the actual damages incurred. The use of oil for mosquito extermination, however, when such use satisfies pesticide regulations, will not violate the section. It is further required that marina owners be licensed by the division of water pollution control. Licenses will only be issued to marinas satisfying the following requirements: (1) adequate facilities for collection, treatment, and disposal of sewage and other wastes, including facilities for purging and cleaning holding tanks; (2) dockside toilet facilities; and (3) receptacles for disposal of trash and litter. Licenses are valid for one year and are renewable. (Hart-Florida)
W71-12721

WATER SANITATION IN NATIONAL PARKS.
National Park Service, Washington, D.C.

Federal Register, Vol 36, No 154, p 14694 (August 1971). 1 p.

Descriptors: *Ships, *Waste disposal, *Environmental sanitation, *Water pollution control, Regulation, Water pollution, Water pollution sources, Water quality, Water quality control, Sewage, Sewage disposal, Boats, Recreation, Recreation wastes, Public health, Administrative agencies, Federal government, Disposal.

Title 36, section 7.57, Code of Federal Regulations is amended to provide that all vessels in the Sanford Recreation Area with marine toilets constructed to discharge wastes directly into the water shall have their toilets sealed to prevent discharge. Chemical or other type marine toilets with approved holding tanks or other storage containers will be permitted, but they may be discharged or emptied only at designated sanitary pumping stations. (Hart-Florida)
W71-12726

WATER POLLUTION CONTROL ACT.
West Virginia Code, secs. 20-5A-1 thru 20-5A-24 (1970) and sec. 20-5A-15 (1971 Supp).

Descriptors: *West Virginia, *Water pollution control, *Administrative agencies, *Pollution abatement, Water pollution, Water pollution treatment, Treatment facilities, Water quality, Water quality control, Regulation, Legislation, Legal aspects, Permits, Administrative decisions, State governments, Standards, Eminent domain, Remedies, Waste water (Pollution).

West Virginia's water pollution act contains eight parts. The legislature's declaration of policy is contained in part I, along with definitions of eighteen terms used in the act. The general powers and duties of the Chief of the Division of Water Resources and the Water Resources Board with respect to pollution are delineated in part II, which also contains authorization for promulgation of water quality standards and requirements for inter-intragovernmental comparison. Part III describes those acts prohibited without a permit, and prescribes the form and procedures for permit application and rules for permittees. Information on all discharges is required by part IV to be filed with the Chief, and part IV also prescribes the requirements and procedures for various types of pollution abatement orders by the Chief. Moreover, authorization for eminent domain proceedings is contained in part IV. Procedures for administrative appeals to the water resources board and for judicial review are promulgated in part V. Part VI authorizes injunctive relief and states that actions for such relief shall have priority on the circuit court docket. Criminal penalties for violations of the act are prescribed in part VII, along with civil liability provisions. Part VIII states that existing remedies are preserved, and provides for severalability and priority in case of conflicting legislation. (Hart-Florida)
W71-12728

POLLUTION CONTROL AND THE BUDGET,
Illinois Environmental Protection Agency, Springfield.
For primary bibliographic entry see Field 05G.
W71-12731

THE POLLUTION CONTROL BOARD: A FIRST REPORT,
Illinois Environmental Protection Agency, Springfield.
D. P. Currie.
Environment: Illinois, p 16-21, January 1971. 6 p.

Desriptors: *Illinois, *Administrative decisions, *Water pollution control, *Evaluation, Environmental sanitation, Standards, Regulation, Administration, Administrative agencies, Water pollution, Water pollution sources, Water quality, Water quality control, Pollution abatement, Water resources, Water policy, Air pollution, Public health, Air pollution effects, Water law, Legal aspects.

Illinois has a Pollution Control Board which adopts regulations and determines whether such regulations have been violated. Four alert stages have been created for air emissions. Regulations to control air pollution have been proposed. Secondary treatment facilities are required for sewage, and the Board is considering advancing the deadlines for such treatment. The feasibility of requiring tertiary treatment for sewage is also being explored. The allowable phosphate content of effluents discharged into Lake Michigan has been reduced and may be extended to all state waters. The Board has proposed regulations to forbid essentially all mercury discharges. The Board has no power to investigate infractions but merely decides cases brought before it. Much enforcement is accomplished by granting limited variances, but fines have been imposed along with such variances. Examples of water pollution cases before the Board are provided. The Board needs additional powers over pesticides and solid wastes. The Board should have power to impose money charges for the discharge of contaminants or the sale of articles which create problems of solid waste disposal. (Robinson-Florida)
W71-12738

POLLUTION TAXES.
National Wildlife Federation, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-12752

ESTABLISHMENT OF POLLUTION STANDARDS; ASCERTAINMENT OF VOLUME OF WATER; REGULATION OR PROHIBITION OF DISCHARGE OF WASTE; CERTIFICATION; ILLEGAL DISCHARGE OF WASTE; POLLUTION OF WATER; RECOVERY OF CIVIL DAMAGES, ATTORNEY GENERAL TO INSTITUTE ACTION; JURISDICTION IN DISTRICT COURTS,

Louisiana Rev. Stat. secs. 56:1439, 56:1440, 56:1446 (1971 Supp).

Descriptors: *Lousiana, *Water pollution control, *Permits, *Waste disposal, Regulation, Pollution abatement, Water pollution, Standards, Legislation, State governments, Federal government, State jurisdiction, Legal aspects, Wastes, Waste disposal,

Public health, Fish, Wildlife, Damages, Remedies, Supervisory control (power).
Identifiers: Federal Water Pollution Control Act.

The Commission is hereby authorized on behalf of Louisiana, to make the certifications which applicants for federal licenses or permits are required to provide to the appropriate federal agency under section 21 of the Federal Water Pollution Control Act. No person shall discharge or permit to be discharged into any state waters waste or pollution that will tend to destroy aquatic or animal life or be injurious to the public health or against the public welfare in violation of any regulation of the Commission. No person engaged in logging operations shall discharge and leave in navigable waters any trees or treetops. Civil damages may be recovered from any person who without, or in violation of, a permit causes pollution of state waters that results in the death of wild birds, wild quadrupeds, fish, or other aquatic life. The Commission shall notify the responsible party of the amount of damages claimed by the Commission and may effect such settlements as it deems reasonable. If no settlement is reached within sixty days the attorney general shall bring a civil action to recover the damages. (Horwitz-Florida)
W71-12758

POLLUTION OF STATE WATER BODIES; DISCHARGE OF UNTREATED WASTES INTO THE MISSISSIPPI RIVER.

Louisiana Rev. Stat. Secs. 56:1461 thru 56:1464.4 (1971 Supp).

Descriptors: *Louisiana, *Mississippi River, *Wildlife conservation, *Water pollution control, Administrative agencies, Water pollution, Standards, Permits, Legislation, State governments, State jurisdiction, Water pollution sources, Water pollution effects, Public health, Legal aspects, Remedies, Waste disposal, Treatment facilities.

Water pollution includes the introduction into Louisiana waters of any substance which results in the killing of fish or other aquatic life in a manner materially detrimental to the interests of the state, renders the water unfit for maintenance of the normal fish or aquatic life characteristics of the waters, or in any way adversely affects the interests of the state in respect to its fish or other aquatic life. In order to prevent the pollution of any stream or other water body, the discharge of any substance which causes water pollution is herein prohibited. The Act does not, however, apply to any unintentional pollution resulting from the production of agricultural products. Civil and criminal penalties are set forth. The intentional discharging of any untreated wastes into the Mississippi River is prohibited. All such wastes shall receive the best practicable secondary treatment not later than December 31, 1972. Enforcement procedures provide for civil actions and penalties of up to $10,000 per offense. Such enforcement procedures are in addition to other authorized remedies. (Horwitz-Florida)
W71-12759

MAN AND HIS ENVIRONMENT '68,
Michigan Natural Resources Council, East Lansing.
For primary bibliographic entry see Field 05G.
W71-12760

THE POTOMAC--PARTNERS IN PROGRESS--1969-1970.
Interstate Commission on the Potomac River Basin, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-12761

FLORIDA COASTAL ZONE APPLIED RESEARCH NEEDS.
Florida State Dept. of Natural Resources, Tallahassee. Coastal Coordinating Council.
For primary bibliographic entry see Field 02L.
W71-12762

PROTECTING THE WORLD ENVIRONMENT IN THE LIGHT OF POPULATION INCREASE.
Executive Office of the President, Office of Science and Technology, Washington, D.C.
For primary bibliographic entry see Field 06G.
W71-12763

INSTITUTIONAL ARRANGEMENTS AND PROGRAMS.
Indiana Department of Natural Resources, Indianapolis, Indiana.

Element XI, State Water Plan, Indianapolis, Indiana, March, 1970. 91 p, 15 fig, 20 ref, 1 biblio.

Descriptors: *Indiana, *Planning, *Water resources development, *Water law, Water pollution, Water pollution control, Water pollution treatment, Administrative agencies, Administration, State governments, Financing, Government finance, Riparian rights, Legislation, Legal aspects, Judicial decisions, Water resources, Water rights, Cities, Interstate commissions, Non-structural alternatives, Research and development, Water policy, Water conservation.

This draft is element XI of a thirteen element State Water Plan for Indiana. Element XI contains the institutional arrangements and programs portion of the Plan. Following an introduction and summary, the administrative structure of the Plan is delineated. Organization, programs, and responsibilities are described for: (1) interstate commissions and agencies with which Indiana is involved, (2) state departments and agencies, and (3) special purpose districts and other agencies. State water law is then discussed; a synopsis of statutes and case law is given, along with various water rights doctrines and laws prescribed by regulatory authorities. Indiana's centralized approach to responsibility for water management functions is discussed in the policy section. Other areas of policy described are: (1) home rule; (2) financing; (3) cooperation, coordination, and cost-sharing; (4) use of existing authority; and (5) recent changes in policy. Various state programs are discussed, including: (1) research, (2) data collection and interpretation, (3) planning, (4) construction and development, (5) regulation, (6) drainage, (7) irrigation, (8) control of erosion and sedimentation, and (9) reservoir sites-acquisition and reservation by zoning. (Hart-Florida)
W71-12764

SALT WATER AND WASTE DISPOSAL WELLS: STATE REGULATIONS AND GEOLOGICAL PROBLEMS,
Louisiana Geological Survey, Baton Rouge.
For primary bibliographic entry see Field 05G.
W71-12765

E-P-A STEPS UP CONTROL PROGRAM,
For primary bibliographic entry see Field 05G.
W71-12766

WATER POLLUTION - 1970, PART 3.
United States Senate Committee on Public Works, Washington, D.C. Subcommittee on Air and Water Pollution.
For primary bibliographic entry see Field 05G.
W71-12767

WATER POLLUTION--1970 PART 4.
For primary bibliographic entry see Field 05G.
W71-12768

SAFE DRINKING WATER.
For primary bibliographic entry see Field 05F.
W71-12769

WATER QUALITY STANDARDS: INTERSTATE WATERS WABASH RIVER AND TRIBUTARY STREAMS CROSSING INTO INDIANA.
Illinois Sanitary Water Board, Springfield.
For primary bibliographic entry see Field 05G.
W71-12770

WATER POLLUTION CONTROL IN GEORGIA.
Georgia Water Quality Control Board, Atlanta.
For primary bibliographic entry see Field 05G.
W71-12771

THE NATIONAL WATER COMMISSION AND THE WATER RESOURCES COUNCIL,
For primary bibliographic entry see Field 05G.
W71-12772

REPORT TO THE PRESIDENT AND TO THE COUNCIL ON ENVIRONMENTAL QUALITY.
Citizens' Advisory Committee on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-12773

IMCO CIVIL LIABILITIES CONVENTIONS.
United States Senate Committee on Public Works, Washington, D.C. Subcommittee on Air and Water Pollution.
For primary bibliographic entry see Field 05G.
W71-12774

OIL POLLUTION OF THE MARINE ENVIRONMENT - A LEGAL BIBLIOGRAPHY.
United States Senate Committee on Public Works, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-12775

OCEAN WASTE DISPOSAL.
United States Senate Committee on Commerce, Washington, D.C. Subcommittee on Oceans and Atmosphere.
For primary bibliographic entry see Field 05E.
W71-12776

WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 05G.
W71-12777

PREVENTION OF INDUSTRIAL WASTE POLLUTION.
For primary bibliographic entry see Field 05G.
W71-12778

ADDITIONAL COMMENTS OF SIERRA CLUB ON PROPOSED REGULATIONS BY THE CORPS OF ENGINEERS FOR DISCHARGE OR DEPOSIT INTO NAVIGABLE WATERS.
Sierra Club, San Francisco, Calif.
For primary bibliographic entry see Field 05G.
W71-12779

DEPOSIT OF MOTOR VEHICLE BODIES AND ACCESSORIES INTO THE WATERS OF THE STATE.
For primary bibliographic entry see Field 05G.
W71-12780

AN ACT TO PROTECT THE NATURAL ENVIRONMENT.
For primary bibliographic entry see Field 05G.
W71-12781

WATER QUALITY STANDARDS.
New Mexico Water Quality Control Commission, Sante Fe.
For primary bibliographic entry see Field 05G.
W71-12782

WATER POLLUTION CONTROL (STATE GRANTS AND INDEBTEDNESS FOR WATER POLLUTION CONTROL PROJECTS),

Louisiana Rev. Stat. Secs. 40:2321 thru 40:2327 (1971 Supp).

Descriptors: *Louisiana, *Local governments, *Grants, *Water pollution control, Treatment facilities, Federal government, State governments, Jurisdiction, Financing, Legislation, Legal aspects, Administrative agencies, Waste treatment, Waste disposal, Sewage treatment, Water pollution sources, Project planning, Public health.
Identifiers: *Water Pollution Control Act.

Water pollution control project means any waste treatment facilities, plants, or other works which accomplish the treating, stabilizing, or holding of untreated or inadequately treated sewage or other wastes. Louisiana is authorized to make grants to local governments to assist them in the construction of water pollution control projects which have qualified for aid under the Federal Water Pollution Control Act. Local government applications under this Act shall include the following: total estimated costs of the project, the amount of federal assistance anticipated, the amount which the applicant will contribute, and a request of state grants for the balance of the estimated costs. The State Bond Commission is authorized to issue a maximum of $15 million in revenue bonds to provide funds to supplement federal grant offers. State participation, however, is limited to 25 percent of the costs of any such water quality control project. Specific requirements are also set forth for the redemption of state bonds and the refunding of local bonds issued in anticipation of state participation. All such bonds are limited to the financing of water pollution control projects. (Horwitz-Florida)
W71-12859

PARISH PURPOSES; MUNICIPAL PURPOSES (POWER TO INCUR INDEBTEDNESS TO CONSTRUCT POLLUTION CONTROL AND OTHER FACILITIES).

Louisiana Rev. Stat. Secs. 39:552, 39:553 (1968).

Descriptors: *Louisiana, *Financing, *Pollution abatement, *Local governments, Legislation, Water pollution control, State governments, Sewage disposal, Treatment facilities, Loans, Project planning, Sewage treatment, Drainage systems, Pumping plants, Levees, Sewers, Municipal wastes.

The governing authorities of parishes and municipal corporations may incur debt and issue negotiable bonds of the parish or municipality for the construction and maintaince of drains and drainage canals, pumps and pumping plants, dykes and levees, waste disposal facilities, sewers and sewerage disposal works, and facilities for pollution control and abatement. Debt may be incurred and bonds issued for any necessary equipment and furnishings for works, buildings, and improvements. (Horwitz-Florida)
W71-12861

DRAINAGE OF OIL, SALT WATER, ETC. INTO NATURAL DRAIN PROHIBITED; PENALTIES.
Louisiana Rev. Stat. sec. 38:216 (1968).

Descriptors: *Louisiana, *Oil wastes, *Water pollution control, *Irrigation water, Legislation, Administrative agencies, Standards, State governments, State jurisdiction, Water pollution, Water quality, Water quality control, Oil, Oil industry, Saline water, Saline water intrusion, Legal aspects, Water pollution sources, REMEDIES, Drainage practices, Drainage effcts, Waste disposal.

No person shall willfully drain any oil, salt water, or other noxious or poisonous substances or gases from any pumps, reservoir, wells, or oil fields into any natural stream or drain from which water is taken for irrigational purposes. There are, however, two exceptions to this prohibition. Such activity may be exempted if authorized under a permit issued by the Stream Control Commission. Discharging wastes into water that is considered to be unfit for irrigation. Violations are punishable by fines of not less than $100 nor more than $2000 or imprisonment for not less than 30 nor more than 90 days. Each day of violation constitutes a separate offense. (Horwitz-Florida)
W71-12863

UNLAWFUL REFUSE DUMPING - EXCEPTIONS, PENALTIES, AND ENFORCEMENT.
For primary bibliographic entry see Field 05G.
W71-12865

DELAWARE'S NEW 'KEEP OUT' SIGN.
Business Week, July 3, 1971, p 20-21. 2 p.

Descriptors: *Delaware, *Water pollution control, *Permits, *Oil industry, State governments, Legal aspects, Legislation, Bays, Administrative agencies, Water pollution, Water pollution sources, Water quality, Water quality control, Pollution abatement, Industry, Oil, Ships, Islands, Non-structural alternatives.

Despite its long-established policy of seeking industry through liberal corporate laws, Delaware, in July 1971, enacted a new law reversing its position to some degree. The new law prohibits chemical plants, oil refineries, steel and paper mills, and other heavy industrial facilities from locating on the Delaware coast. Moreover, additions to existing plants are prohibited without a permit from a new state agency. Shell Oil, which assembled 5600 acres on Delaware Bay to erect a $200 million refinery, has indicated it may challenge the new legislation. The law also prevents a 300-acre offshore island proposed by Zapata-Norness as an oil and coal transshipment facilty. The Federal Maritime Administration recently testified that the law will block the only economic location on the East Coast for a deep-water port. Washington may contest the new law. How the dispute is resolved in Delaware could set a precedent for similar fights elsewhere. (Hart-Florida)
W71-12869

GLOBAL POLLUTION - 1: THE CHINESE INFLUENCE,
J. Lear.
Saturday Review, August 7, 1971, p 41-42. 2 p.

Descriptors: *United Nations, *International commissions, *Foreign countries, *Environmental sanitation, Water pollution control, Pollution abatement, Social needs, International law, Treaties, Legal aspects, Public health, Ecology, Water resources, Water resources development, Water pollution, Permits, Research facilities, Research and development, Soil management, Natural resources, United States, Non-structural alternatives
Identifiers: *China.

The first United Nations Conference on the Human Environment is scheduled for June 1972, in Stockholm. Many people feel this meeting would be an excellent opportunity for China to return to the family of nations. Chinese participation is important since the Chinese consider man as only one of many living creatures and hold him responsible for adjustment to his environment. The worst environmental pollution, however, is in those parts of Asia where western man's equation of technology with human destiny has been accepted. Sweden was the moving force in initiating the Conference. A Canadian, Maurice Strong, has been chosen as the secretary-general of the Conference. The United States is enthusiastically backing the Conference and has prepared a draft of a convention to ban unlicensed dumping in the oceans. Other areas in which the United States is interested are atmospheric monitoring, a World Heritage Trust to protect environmentally critical areas and endangered species, soil management, and regional research institutes. Should these fail, the United States will still be an eager signatory to a universal declaration of man's obligation to protect his environment. (Robinson-Florida)
W71-12875

GLOBAL POLLUTION - III: U. N. AS POLICEMAN,
R. W. Gardner.
Saturday Review, August 7, 1971, p 47-50. 4 p.

Descriptors: *United Nations, *Environmental sanitation, *Political aspects, *International commissions, International law, Water resources development, Ecology, Environmental effects, Treaties, Pollution abatement, Water pollution, Water pollution control, Water pollution effects, Water pollution sources, Socialneeds, Social aspects, Economics, Natural resources, Pollutants, Oceans, Institutional constraints, Regime.

The United Nations Conference on the Human Environment will deal with the following six subjects: (1) planning and management of the environmental quality of settlements everywhere; (2) environmental aspects of natural resource management; (3) identification and control of environmental pollutants and nuisances of broad significance; (4) educational, informational, social, and cultural aspects of environmental issues; (5) economic development and the environment; and (6) international organizational implications of proposals for action. Because the Conference lasts only two weeks, a great deal of prior preparation is taking place. The most important item on the agenda will be international organizational implications of proposals for action. New institutions for environmental action are needed. A new specialized agency should not be formed, but a central brain should be established within the United Nations to coordinate and draw on existing United Nations agencies. Suggestions for implementing such a brain are discussed. Another area dealt with is the type of institutions needed to deal with environmental disputes. Finally, the author considers the problem of pollution of the seas and the possible necessity of international machinery to control such pollution. (Robinson-Florida)
W71-12879

TAXING U. S. POLLUTERS,
L. Moss.
Saturday Review, August 7, 1971, p 51. 1 p.

Descriptors: *Cost allocation, *Taxes, *Pollution abatement, *Biochemical oxygen demand, Tax rate, Water pollution, Water pollution control, Water pollution sources, Water quality, Water quality control, Pollutants, Public health, Environmental sanitation, Effluents, Non-structural alternatives, Estimated costs, Financial feasibility, Use rates, Air pollution.
Identifiers: *Effluent charges.

A tremendous amount of pollution is caused by the emission of sulfur oxides. No method is presently available to reduce such emissions. It is unlikely that industry desires such technology as they would have to pay the cost of implementation. Pollution taxes, however, would motivate industry to develop and implement pollution reduction devices. This approach would also be the cheapest method of achieving environmental quality. The author recommends the following proposals: (1) a tax of 20 cents per pound of sulfur, (2) a uniform application of the tax throughout the nation, and (3) revenue from the sulfur tax should go into a general fund rather than a trust fund. Other candidates for pollution taxes are nitrogen oxides, carbon monoxides, hydrocarbons, particulate matter in the air, and the biological oxygen demand made by effluents in water. (Robinson-Florida)
W71-12893

CRYSTAL WATERS ACT.

Minnesota Stat Ann sec 116.15 (1971 Supp).

Descriptors: *Minnesota, *Treatment facilities, *Water pollution control, *Grants, Legislation, State governments, Water pollution, Sewage disposal, Sewage treatment, Water quality control, Legal aspects, Cost payment, Interest, Payment, Participating funds, Separable costs, State jurisdiction, Federal government, Administrative agencies.

Upon the determination of the Minnesota Pollution Control Agency that a water pollution control project is eligible for funds under a federal grant, a state grant-in-aid for the payment of interest may be made in anticipation of the receipt of the federal grant. The Pollution Control Agency may make this determination before the actual commitment of federal funds if the federal agency concerned has stated that the project falls under possible grant reimbursement provisions of federal law. The Pollution Control Agency shall receive from the applicant copies of documents necessary to establish: (1) the nature, location, and cost of the project; (2) the federal agency which has or is expected to approve the grant; (3) the priority of the project; (4) the amounts and sources of funds available to pay project costs; (5) the probable dates of site acquisition and construction; and (6) the probable dates and amounts of disbursement of the federal funds. Provisions are also established governing the amount of state grants that may be issued to any one project and the total funding for the entire program. (Horwitz-Florida)
W71-12906

MARINE TOILETS.
Minnesota Stat Ann sec 361.29 (1971 Supp).

Descriptors: *Minnesota, *Water pollution control, *Sewage treatment, *Boating regulations, Legal aspects, Water law, Legislation, State governments, Water pollution, Water pollution sources, Water quality, Water quality control, Pollution abatement, Sewage, Sewage disposal, Boats, Public health, Administrative decisions, Waste treatment, Waste disposal, Waste water disposal, Waste water treatment, Boating.

No person shall discharge into the waters of Minnesota any wastes or untreated sewage. No marine toilets may be used unless equipped with a treatment device acceptable to the Minnesota Pollution Control Agency, after April 1, 1966. The Agency shall furnish a list of acceptable treatment devices upon request, and the Commissioner of Natural Resources shall furnish all sheriffs with a list of such treatment facilities. Any treatment device accepted by another state for use on waters within their jurisdiction shall be acceptable while such watercraft are upon the waters of Minnesota if such devices are in good working order. (Robinson-Florida)
W71-12915

WATER POLLUTION.
New Republic, Vol 164, No 13, p 8-9 (March 27, 1971). 2 p.

Descriptors: *Rivers and Harbors Act, *Administrative agencies, *Water pollution control, *Pollution abatement, Water quality control, Water resources, Federal government, Water law, Legal aspects, Legislation, Water pollution, Water quality, Regulation, Permits, Environmental sanitation, Water policy, Wastes, Industrial wastes, Waste disposal, Waste water disposal, Pollutants, Remedies, Institutional constraints.

The history of the Refuse Act illustrates what does not happen when a good law is not enforced. For 71 years the Refuse Act was not enforced by the Corps of Engineers. In 1970, Representative Reuss of Wisconsin rediscovered the Act and notified federal attorneys in Wisconsin that it was being violated. The Justice Department insists that it was all right to ignore the Refuse Act if the polluters had promised the Federal Water Quality Administration that they would reduce their polluting. Many of these promises have not been kept. A new version of the Refuse Act was proposed under which the permit program passes from the Corps of Engineers to the Environmental Protection Agency. This is an improvement. The great weakness of the new version is that it applies only to interstate waters. No federal body can now prevent the pollution of intrastate waters. In effect, the original domain of the Refuse Act is reduced by four-fifths. (Robinson-Florida)
W71-12919

NADER ON WATER.
Time, April 26, 1971, p 59. 1 p.

Descriptors: *Federal government, *Environmental sanitation, *Water pollution control, *Water quality control, Pollution abatement, State governments, Water law, Legal aspects, Water policy, Environment, Ecology, Economics, Economic feasibility, Water pollution, Water quality, Water pollution sources, Regulation, Industrial wastes, Water resources, Administrative agencies, Evaluation.

Ralph Nader presented a report entitled Water Wasteland. The report states that the federal program to curb water pollution is a failure. The main problem is a failure to control industrial effluents. Nader's researchers found that manufacturers' expenditures for pollution control amounted to less than .2% of annual revenues. Much of this sum, however, was spent for purifying incoming water for manufacturing purposes. The Federal Government has left enforcement largely to the states, but the states often set low standards. A policy of trying to talk offenders into compliance has been followed, but this process usually takes years. Nader is not optimistic about the effectiveness of either Senator Muskie's or President Nixon's water-quality bills. He proposes that pollution-control officers should investigate and issue abatement orders immediately - or face penalties themselves. The Nader report says that industry will not suffer from a big cleanup: more jobs will be created by intensified cleanup activities. (Robinson-Florida)
W71-12920

PHOSPHATES DOWN BUT FAR FROM OUT.
For primary bibliographic entry see Field 05G.
W71-12922

MINSHALL V CORPORATION COMMISSION (VALIDITY OF COMMISSION'S ORDER TO FORMER OPERATOR TO REPAIR LEAKING OIL WELL).
485 P 2d 1058-1062 (Okla 1971).

Descriptors: *Oklahoma, *Oil wells, *Administrative decisions, *Pollution abatement, Judicial decisions, Legal aspects, Administrative agencies, Legislation, State governments, Pollutants, Saline water, Brine, Natural gas, Oil, Exploration, Drill holes, Well regulations, Regulation, Leakage.

Defendant corporation commission found that a formerly plugged and abandoned oil and gas well was leaking and ordered plaintiff, the former operator of the lease, to replug and repair the leak. Plaintiff appealed. The Oklahoma Supreme Court agreed with plaintiff that a 1917 statute, which required the plugging of abandoned wells, did not require replugging. The court did not agree, however, that a 1965 replugging statute did not apply retroactively to wells plugged before its effective data. The 1965 statute authorized defendant to enter land and repair or replug a well which it found to be leaking. The court stated that the statute applied to all abandoned wells leaking salt water, oil, gas, or other pollutants. Despite the court's holding that the statute applied to the disputed well, it refused to sustain defendant's order to plaintiff. The statute was found to simply authorize defendant to enter and repair a leaking well, but it did not authorize defendant to order the former operator to remedy the condition. Hence, the cause was remanded to defendant with instructions to delete from its order the requirement that plaintiff repair the leak. (Hart-Florida)
W71-12923

PLUGGING OIL AND GAS WELLS.
Indiana Stat Ann secs 46-1733 thru 46-1740 (1970 Supp).

Descriptors: *Indiana, *Water pollution control, *Oil wells, *Injection wells, Administrative agencies, Administrative decisions, Legislation, Water law, Legal aspects, Water pollution, Water pollution sources, Water quality, Water quality control, Water resources, Oil, Natural gas, Brine disposal, Oil wastes, Saline water, Brine, Salinity, Oil industry, Oil fields.

A supplemental remedy is herein provided when any persons obligated to plug an oil, gas, or salt water disposal well fails to do so, or when the identity of said person or persons is unknown. The Department of Natural Resources may plug any well leaking deleterious substances, after proper notice. No notice is required in emergency situations involving irreparable injury. Persons plugging or repairing wells pursuant to an order of the Department shall not be liable for any damages resulting from operations necessary to plug such wells, nor shall they be responsible for any necessary remedial work. The initiation or support of a proceeding before the Department or an attempt to remedy the condition of any well under authority of this Act shall not be considered an admission of liability. Any person who has no obligation to plug or repair a well, but who does so, shall have a cause of action against those so obligated for reasonable costs and expenses. (Robinson-Florida)
W71-12925

MUNICIPAL AUTHORITY OVER WATERCOURSES AND SEWERS.
Indiana Stat Ann sec 48-503 (1970 Supp).

Descriptors: *Indiana, *Sanitary engineering, *Local governments, *Water resources development, Legislation, Cities, Legal aspects, Lakes, Ponds, Streams, Water resources, Sewers, Pipes, Pipelines, Construction, Engineering, Engineering structures, Environmental engineering, Condemnation, Damages, Eminent domain, Supervisory control (Power), Jurisdiction.

Every city or town shall have exclusive power over watercourses, sewers, and drains and may prescribe construction requirements. Cities and towns are herein authorized to: (1) drain or fill ponds or low grounds; (2) straighten and deepen streams; (3) establish the lines and limits of the banks of streams, ponds, and lakes; (4) provide for the improvement of such banks; and (5) provide for the construction of all sewers and drains and the laying of all pipes. Assessments for the cost of such improvements may be made on the property benefited thereby, or such costs may be paid out of the general fund. A city or town may remove or appropriate structures or land upon the payment of damages as provided by law. A city or town shall have jurisdiction ten miles beyond its corporate limits for the purpose of appropriating lands and other property. (Robinson-Florida)
W71-12927

CLEAN STREAMS LAW--INDUSTRIAL WASTES.
Pennsylvania Stat Ann tit 35, secs 691.301 thru 691.317 (1964), as amended, (Supp 1971).

Descriptors: *Pennsylvania, *Water pollution control, *Water quality control, *Industrial wastes, Water law, Legal aspects, Legislation, Cities, Water pollution, Water quality, Water pollution sources, Permits, Regulation, Water policy, Treatment facilities, Waste treatment, Waste disposal, Local governments, Waste water (Pollution), Waste water disposal.

No person or municipality shall discharge or permit industrial wastes to be discharged into the waters of Pennsylvania unless such discharge is authorized by the rules and regulations of the Sanitary Water Board or a permit has been obtained from the Department of Health. A discharge of industrial

wastes shall include discharges into a sewer system or other facility which flows into the waters of Pennsylvania. Public notice shall be given of every application for a permit. A discharge of industrial wastes without a permit or contrary to the terms of a permit or contrary to the rules and regulations of the Board is hereby declared to be a nuisance. All plans, designs, and relevant data for the erection and construction of treatment works shall be submitted to the Department for approval. Any construction or erection not approved by the Department, or any treatment works not maintained or operated in accordance with rules and regulations of the Board, is hereby declared a nuisance. (Robinson-Florida)
W71-12952

CLEAN STREAMS LAW--OTHER POLLUTIONS AND POTENTIAL POLLUTION.
Pennsylvania Stat Ann tit 35, secs 691.401, 691.402 (1964), as amended (Supp 1971).

Descriptors: *Pennsylvania, *Water pollution control, *Permits, *Waste disposal, Water quality control, Administrative agencies, Legislation, Water law, Legal aspects, Regulation, Permits, Water pollution, Water quality, Environmental sanitation, Water policy, Water resources, Administrative decisions, Cities, State governments, Local governments, Waste disposal, Waste storage, Waste water (Pollution).

It is unlawful for any person or municipality to place into the waters of Pennsylvania, or allow to be discharged from property owned or occupied by such person or municipality, any substances resulting in pollution as herein defined. Any such discharge is hereby declared a nuisance. Whenever the Sanitary Water Board finds that any activity, not otherwise requiring a permit, creates a danger of pollution or that regulation is necessary to avoid such pollution, the Board may require that such activity be conducted pursuant to a permit issued by the Department of Health. Persons or municipalities affected shall be given a reasonable time to apply for and obtain such permits. Conducting such activity without or not pursuant to a permit shall be unlawful. Conducting such activity without a permit shall constitute a nuisance. (Robinson-Florida)
W71-12953

CLEAN STREAMS LAW--PROCEDURE AND ENFORCEMENT.
Pennsylvania Stat Ann tit 35, secs 691.601, 691.602, 691.605, 691.609, 691.610 (1964), as amended (Supp 1971).

Descriptors: *Pennsylvania, *Pollution abatement, *Water pollution control, *Remedies, Public health, Legislation, Water law, Legal aspects, Judicial decisions, Water pollution, Water quality, Water quality control, Safety, Permits, Administrative agencies, Administrative decisions, Adoption of practices.

The Attorney General of Pennsylvania, any district attorney, or any solicitor of an affected municipality may bring an action to abate acts herein declared to be a nuisance. No action under the Clean Streams Law may be brought against a municipality discharging sewage under a permit. Except in emergencies, the court may fix a reasonable time for abatement. If necessary, or if the public health so requires, a preliminary injunction may be obtained. Violations of the Clean Streams Law constitute summary offenses. Violation within two years of a conviction in a summary proceeding constitutes a misdemeanor. Each day of continued violation constitutes a separate offense. Civil penalties of up to $10,000, plus $500 for each day of continued violation, may be assessed. The Department of Health may withhold a permit if the applicant has violated a relevant rule, regulation, or order. The Department may issue orders necessary for the enforcement of this Act including, but not limited to, orders modifying, suspending, or revoking permits and orders requiring a cessation of operations. Such an order is in addition to other penalties herein provided. Failure to comply with such orders constitutes a nuisance. (Robinson-Florida)
W71-12954

PENNSYLVANIA SEWAGE FACILITIES ACT.
Pennsylvania Stat Ann tit 35, secs 750.1 thru 750.15 (Supp 1971).

Descriptors: *Pennsylvania, *Sewage disposal, *Local governments, *Treatment facilities, Sewage treatment, Legislation, Legal aspects, Water law, Regulation, Cities, State governments, Grants, Administration, Administrative agencies, Standards, Sewage, Sanitary engineering, Environmental sanitation, Government finance, Planning, Permits.

The Department of Health shall have the power to adopt rules, regulations, standards, and procedures necessary to carry out the provisions of this Act. An advisory committee shall be appointed. Its membership and duties are herein set forth. Official plans for sewerage systems must be submitted by municipalities. Requirements for such plans are specified. The Department may administer grants to municipalities to assist them in preparing such plans. No person shall install or construct individual or community sewage disposal systems without a permit. Procedures and requirements for obtaining such permits are herein detailed. Municipalities shall administer the permit system and shall be reimbursed for one-half of such costs. Municipalities, counties, or joint county health departments may institute proceedings to restrain violations of this Act. Penalties for violations are set forth. Persons aggrieved by the actions of a municipality, county, or joint county health department may appeal to the Secretary of Health. All actions of the Department must be in accordance with the Administrative Agency Law. (Robinson-Florida)
W71-12955

SEWAGE DISPOSAL PLANTS IN CITIES AND TOWNS.
Indiana Stat Ann secs 48-4301 thru 48-4328 (1970 Supp).

Descriptors: *Indiana, *Sewage treatment, *Treatment facilities, *Local governments, Financing, Legal aspects, Legislation, Administrative agencies, Administration, Cities, Municipal wastes, Sanitary engineering, Sewage disposal, Sewers, Waste water (Pollution), Waste water disposal, Waste water treatment, Waste treatment, Government finance, Costs, Condemnation, Supervisory control (Power).

Every city or town may construct, extend, and maintain sewage treatment plants. Necessary land and rights-of-way may be acquired by gift, grant, condemnation, or purchase. Revenue bonds may be issued to pay necessary costs. The municipal agency so designated by law shall be responsible for supervision. A sanitary board with supervisory powers may be created. The membership, duties, and powers of such boards are herein detailed. Provisions for objections by property owners and hearings thereon are set forth. Cities may contract to treat all or part of the sewage of another city. Bonds issued to pay necessary costs shall be paid solely from the revenues of treatment works. Further requirements relating to bond issues are set forth in detail. Methods of establishing rates and collecting charges are herein prescribed. Cities and towns may require connections to their sewer systems. The jurisdiction of cities and towns under this Act shall extend ten miles beyond corporate limits. (Robinson-Florida)
W71-12956

JACKSON PARISH WATERSHED DISTRICT.
Louisiana Rev Sta secs 38:2900 thru 38:2915 (1968).

Descriptors: *Louisiana, *Watershed management, *Water pollution control, *Water districts, Water conservation, Water pollution, State governments, State jurisdiction, Regulation, Legislation, Standards, Permits, Supervisory control (Power), Watersheds (Basins), Water supply, Wildlife management, Water storage, Water quality, Water policy, Local governments, Municipal water, Industrial water.

The Jackson Parish Watershed District is hereby created as an agency of Louisiana which has as its purpose the conservation of soil and water and the development of the natural resources and wealth of the District for sanitary, agricultural, industrial, and recreational purposes. The District is given all the rights, privileges, and immunities of a political subdivision of the state. Through the Board of Commissioners, the District may conserve the fresh water supply within its boundaries for the benefit of its inhabitants, and it may also provide water for commercial, municipal, and other uses within and without the District. The organization, membership, procedures, jurisdiction, and powers of the Board are herein established. The Board may make and enforce any rules necessary to accomplish its duties. Pollution of any lake or stream in the District is specifically prohibited. Pollution is defined as the discharging of any oil, salt water, or other noxious or poisonous gases or substances which would render the water unfit for irrigation purposes or destroy aquatic and fish life. (Horwitz-Florida)
W71-12957

AN ORDINANCE AMENDING ORDINANCE 1971-1 PROHIBITING SALE AND DISTRIBUTION OF ANY DETERGENT CONTAINING PHOSPHORUS IN EXCESS OF .01 PERCENT, AFTER DECEMBER 31, 1972.
Ordinance 1971-1, Lake County Board of Commissioners, Lake County, Florida, as amended, February 1, 1971.

Descriptors: *Florida, *Local governments, *Detergents, *Phosphates, Regulation, Water pollution sources, Legal aspects, Standards, Jurisdiction, Water pollution, Lakes, Streams, Water pollution control, Water conservation, Chemical wastes, Domestic wastes, Industrial wastes, Phosphorus compounds, Legislation.
Identifiers: *Lake County (Florida).

To protect lakes and streams from pollution by phosphorus, this ordinance regulates the sale of detergents containing phosphorus. The Ordinance provides specific definitions for the following terms: (1) synthetic detergents; (2) polyphosphate builder and phosphorous; (3) recommended detergent use level; (4) machine dishwasher; (5) dairy, beverage, and food processing equipment; and (6) industrial cleaning equipment. As amended, the Ordinance provides that the sale, exposure to sale, or the furnishing free of charge of any detergent is prohibited in Lake County, Florida after March 31, 1971, unless the packaging is clearly labeled with the phosphorus content and clearly sets forth the percentage of phosphorus in terms of weight per container. The Ordinance further prohibits the sale of any detergent, after March 31, 1971, containing more than 8.7 percent of phosphorus by weight. Notwithstanding this provision, detergents manufactured for use in machine dishwashers, dairy equipment, beverage equipment, food processing equipment, and industrial equipment shall not contain in excess of .01 percent phosphorus, after December 31, 1972. Each day of violating such provisions constitutes a misdemeanor. (Horwitz-Florida)
W71-12984

WATER POLLUTION CONTROL FACILITIES, TAX EXEMPTION.

Michigan Comp. Laws Ann. secs. 323.351 thru 323.358 (1967)

Descriptors: *Michigan, *Water pollution control, *Treatment facilities, *Taxes, Water pollution, Water pollution treatment, Water quality control, Tax rate, Government finance, Legislation, State governments, Construction costs, Financing, Monetary benefits, Waste disposal, Waste treatment, Sewage treatment, Administrative agencies, Legal aspects, Adoption of practices, Non-structural alternatives.

A facility used for water pollution control may be granted an exemption from personal property, sales, and use taxes. Application shall be made to the State Tax Commission which shall grant exemptions with the approval of the Water Resources Commission. The application shall contain the plans and specifications of the facility, including materials to be used, equipment acquired, and the proposed operating procedure for the control facility. Tax exemptions herein granted shall be reduced to the extent of any commercial or productive value derived from any materials captured or recovered. An application for tax exemption shall be granted if the Water Resources Commission finds that the facility is designed and operated primarily for the control, capture, and removal of industrial waste from water. A certificate shall then be issued to the applicant. Such certificate may be revoked or modified if the Tax Commission finds that: (1) the certificate was obtained by fraud or misrepresentation, or (2) the water pollution control facility has not substantially proceeded to construction or is no longer in use. Procedures for appeals and the adoption of rules and regulations are herein provided. (Smiljanich-Florida)
W71-12986

RARDIN V MARCOTTE (INJUNCTIVE RELIEF AGAINST SEWAGE PLANT DISCHARGES).
398 P 2d 351-355 (Kan. 1965).

Descriptors: *Kansas, *Pollution abatement, *Sewage disposal, *Dam construction, Earth dams, Waste water disposal, Discharge (Water), Judicial decisions, Legal aspects, Water law, Permits, Legislation, Levees, Watercourses (Legal), Natural streams, Ponding, Surface waters, Drainage, Environmental sanitation, Drainage water, Water pollution, Water pollution sources, Natural flow, Dams.
Identifiers: Injunction (Prohibitory).

Plaintiff upper landowners sought a permanent injunction barring defendant lower landowners from maintaining a dam which caused water to back up on plaintiffs' land. Defendants secured joinder of plaintiff city and requested injunctive relief to keep the city from draining sewage water onto defendants' land. Plaintiffs' discharge of sewage water was done pursuant to a state permit authorizing such discharges. Defendants' dam, however, was constructed without the required state approval. Plaintiffs contended that defendants were unlawfully maintaining the dam. Defendants asserted that plaintiffs were maintaining a nuisance by dumping the sewage water. The Supreme Court of Kansas held that it is proper to enjoin the maintenance of a dam constructed without state authority where such dam causes the natural flow of water to be obstructed and discharged onto the land of another. The court also ruled that sewage discharges do not constitute a nuisance per se. Finding no evidence that indicated that plaintiff's discharge constituted a nuisance in fact, the court affirmed the judgment for plaintiffs. (Johnson-Florida)
W71-12988

INGRAM V CITY OF GRIDLEY (AWARD OF DAMAGES TO DAIRY FARMER FOR POLLUTION NUISANCE).

224 P.2d 798-805 (Dist Ct App Cal 1950).

Descriptors: *California, *Water pollution effects, *Damages, *Water pollution sources, Water pollution, Cities, Drainage districts, Industrial wastes, Sewage, Sewage disposal, Ditches, Pollutants, Pollution abatement, Odor, Taste, Milk, Dairy industry, Farms, Cattle, Legal aspects, Judicial decisions, Remedies.

Plaintiff diary farmer sought to recover damages from defendants for pollution injury. Defendants municipality and canning company discharged sewage into a gravel pit, which drained through defendant drainage district's ditch into a slough flowing through plaintiff's property. Defendant district contended that it had not contributed to the nuisance and should be discharged. The California District Court of Appeals, however, rejected the district's motion because the pit had drained elsewhere until the district dug the ditch. Furthermore, it was observed that the district received contributions from the other defendants to help maintain the ditch. All defendants contested the award of damages to plaintiff because no diminution in market or rental value was shown at trial. Plaintiff showed at trial an impairment of the use and enjoyment of his dairy farming operations as a result of the noxious odor, resulting in lowered flavor ratings of his milk. Therefore, the court sustained the award. Defendants were furthermore held jointly and severally liable for the injury, but contended that damages should be apportioned. The court determined that defendants had jointly created the nuisance and that plaintiff should not have to prove separate damages since defendants could apportion amongst themselves. (Hart-Florida)
W71-12997

ROCK ISLAND OIL AND REFINING CO. V HUTCHINSON (LIABILITY OF OIL COMPANY FOR POLLUTING CREEK AND CAUSING MORTALITY OF CATTLE).
255 P.2d 234-239 (Okla. 1953).

Descriptors: *Oklahoma, *Damage, *Cattle, *Water pollution effects, Water pollution, Water pollution sources, Oil, Oil wastes, Oil industry, Streams, Toxicity, Odor, Wildlife, Judicial decisions, Legal aspects, Impaired water quality, Water quality, Color, Aesthetics, Effects, Mortality, Pollutants, Water supply.

Plaintiff cattle rancher sought to recover damages from defendant oil company for loss of livestock from water pollution and the expense of obtaining an unpolluted water supply. At trial, plaintiff was awarded $659 actual damages and $1500 exemplary damages. On appeal, defendant contended that the evidence presented at trial was insufficient to sustain the verdict and judgment. The Oklahoma Supreme Court reviewed the evidence, in which several witnesses stated that they saw oil wastes discharging into the creek from defendant's plant and that the polluted condition of the creek had killed much small game in the area. The court affirmed the verdict of the lower court. Defendant also challenged the award of exemplary damages. Since plaintiff had presented no evidence of gross negligence, evil intent, or reckless disregard for plaintiff's right by defendant, the court reversed the judgment for exemplary damages. (Hart-Florida)
W71-12999

PORTABLE DRILLING CORP V. GUINN (DAMAGE TO AGRICULTURAL LAND FROM ADJACENT OIL WELL).
226 P.2d 923-927 (Okla. 1950). 5 p.

Descriptors: *Oklahoma, *Damages, *Oil wells, *Vegetation, Crops, Impaired water quality, Water pollution, Pollutants, Oil, Oily water, Oil wastes, Overflow, Oats, Natural streams, Remedies, Judicial decisions, Legal aspects, Oil fields, Oil industry, Cultivated lands.

Plaintiff landowner sued defendant oil drilling corporation for damages to land and crops resulting from pollution. Defendant operated an oil well on land adjacent to plaintiff's property. The well produced deleterious substances which flowed into a creek traversing plaintiff's property. The well produced deleterious substances had been permitted to flow onto plaintiff's land and asserted that all damage occurred prior to plaintiff's acquisition of the land. The Supreme Court of Oklahoma held that: (1) permanent damage to land and damage to growing crops are entirely different elements of damage even when caused by the same thing, (2) both elements of damage may be recovered in the same action, and (3) proof of permanent damage to land does not include the value of growing crops. On grounds the evidence was sufficient to sustain the jury finding that plaintiff's injuries resulted from the overflow from defendant's premises, the court affirmed the judgment for plaintiff. (Shelnut-Florida)
W71-13000

LICENSE FOR VEHICLES CARRYING WASTE; EQUIPMENT CARRYING WASTE.
Michigan Comp Laws Ann secs 325.284, 325.285 (Supp 1971).

Descriptors: *Michigan, *Septic tanks, *Waste disposal, *Environmental sanitation, Legislation, Regulation, Administrative agencies, State governments, Legal aspects, Water law, Cesspools, Sewage disposal, Wastes, Water pollution sources, Water pollution control, Environmental engineering, Cities, Treatment facilities, Domestic wastes, Water supply, Bodies of water, Public health.

All vehicles used to carry wastes from septic tanks, cesspools, or seepage pits shall be licensed by the Commissioner of the Department of Health. The waste carrying tank shall be kept tightly closed in transit to present the escape of contents or odors. The licensee shall deposit all wastes removed from any septic tank, seepage pit, or cesspool into a municipal sewage treatment plant or other designated location having adequate facilities as may be made available for receiving such wastes by the municipality when located within 15 road miles. In the absence of such municipal disposal facilities, wastes shall be disposed of at locations over 200 yards from any residence, business or public gathering place or state highway subject to written approval of the property owner and the local health department. These wastes may be buried on the property from which they originated at least 75 feet from any water supply and 25 feet from any body of water, provided it is covered with at least 12 inches of earth and protected until settled. Under no conditions shall dumping be permitted into or adjacent to any body of water. (Johnson-Florida)
W71-13001

PENNSYLVANIA SOLID WASTE MANAGEMENT ACT.
Pennsylvania Stat. Ann. tit. 35, secs. 6001 thru 6017 (Supp. 1971).

Descriptors: *Permits, *Long-term planning, *Pennsylvania, *Solid wastes, Water pollution sources, Water pollution control, State governments, Legal aspects, Wastes, Transportation, Waste disposal, Cities, Local governments, Legislation, Administrative agencies, Waste storage, Grants, Environmental sanitation, Water pollution, Water quality control, Pollutants, Planning, Multiple-purpose projects, Treatment facilities.

The purpose of this Act is to: (1) establish a comprehensive program of planning and assistance for solid waste management, (2) utilize the capabilities of private enterprise, and (3) require permits for the operation of processing and disposal systems. Each municipality of over 300 per square mile shall submit a plan for solid waste management. The required contents of such plans are set forth. The powers and duties of the Department of Health are detailed. Permits are required for solid waste disposal and transportation: permit application procedures are detailed. The Department shall deny a permit if a danger to the health, safety, environment, or economy of an area will result. All state agencies shall be required to obtain permits.

Eight specified acts or operations dealing with solid waste are prohibited. Municipalities shall be responsible for collecting, transporting, processing, and disposing of solid wastes. If municipalities are polluting the air, water, or land, the Department may order the alteration of existing methods or facilities. Grants are authorized to assist counties and municipalities in solid waste management programs. The Secretary of Health may seek equitable relief to restrain violations of this Act. Penalties for violations are herein provided. (Robinson-Florida)
W71-13005

CLEAN STREAMS LAW--GENERAL PROVISIONS AND PUBLIC POLICY.
Pennsylvania Stat. Ann. tit. 35, secs. 691.1 thru 691.8 (1964), as amended, (Supp. 1971).

Descriptors: *Pennsylvania, *Water pollution control, *Administration, *Adjudication procedure, Legislation, Regulation, Water law, Legal aspects, State governments, Administrative agencies, Reasonable use, Waste disposal, Sewage disposal, Water quality control, Management, Water pollution, Pollution abatement, Treatment facilities, Standards, Water policy, Pollutants.

The discharge of sewage or industrial waste or any substance into the waters of the Commonwealth, which causes or contributes to pollution or creates a danger of pollution, is declared not to be a reasonable or natural use of such waters, to be against public policy, and to be a public nuisance. The Sanitary Water Board shall establish standards wherefrom it can be ascertained whether a discharge does or does not constitute pollution as defined in this Act. It is the duty of the Board to establish policies for effective water quality control and water quality management in the Commonwealth and to adopt such rules and regulations as are necessary. It is the duty of the Department of Health to direct the Commonwealth's water quality control program pursuant to these policies, rules, and regulations and to provide such administrative services for the Board as required. The Act provides for an administrative procedure and for judicial review. Fines and penalties collected under the Act shall be used in the elimination of pollution. Provision is also made for the consolidation of abatement and treatment programs of individual permittees in the same watershed. (Johnson-Florida)
W71-13012

CLEAN STREAMS LAW--SEWAGE POLLUTION.
Pennsylvania Stat. Ann. tit. 35, secs. 691.202, 691.203, 691.210 (1964), as amended, (Supp. 1971).

Descriptors: *Pennsylvania, *Sewage disposal, *Treatment facilities, *Municipal wastes, Legislation, Regulation, Legal aspects, Water law, State governments, Administrative agencies, Water pollution control, Water pollution sources, Waste disposal, Local governments, Sewage, Sewerage, Sewage treatment, Water pollution.

No municipality or person shall discharge sewage in any manner into the waters of this Commonwealth unless such discharge is authorized by regulation or done pursuant to a permit. Such a discharge is declared to be a nuisance. This includes a discharge of sewage by a person or municipality into a sewer system or other facility owned, operated, or maintained by another municipality and which then flows into the waters of the Commonwealth. The Department of Health may order a municipality to acquire, construct, repair, alter, complete, extend, or operate a sewer system and/or a treatment facility, if necessary to prevent pollution or a public health nuisance. The Department may also order a municipality to do what is necessary to assure that there will be adequate sewer systems and treatment facilities for both the present and the future. It shall be the duty of the corporate authorities of the municipality to comply with orders of the Department and they shall be guilty of contempt if they fail to comply. (Johnson-Florida)
W71-13013

POLLUTION FROM ABANDONED MINES.
Pennsylvania Stat. Ann. tit. 35, secs. 760.1, 760.2 (Supp. 1971).

Descriptors: *Pennsylvania, *Water pollution sources, *Water pollution control, *Pollution abatement, Legislation, Legal aspects, Regulations, Administrative agencies, Water pollution, Water quality, Water quality control, Mining, Mine wastes, Strip mine wastes, Strip mines, Mine acids, Adoption of practices, Watershed management, Watersheds (Basins), Water law.

The Secretary of the Department of Mines and Mineral Industries shall initiate an immediate action program to correct pollution from abandoned deep and strip mines on each of the watersheds in Pennsylvania. The Secretary of Mines and Mineral Industries shall present an annual progress report to the Governor and the Governor to the Sanitary Water Board. (Robinson-Florida)
W71-13033

SUMMARY OF LAWS AND REGULATIONS GOVERNING SPILLS AND DISCHARGES OF OIL,
Texaco, In., New York.
For primary bibliographic entry see Field 05G.
W71-13036

OIL POLLUTION CONTROL LEGISLATION AND THE WATER QUALITY IMPROVEMENT ACT OF 1970, THE FEDERAL VIEWPOINT,
Environmental Protection Agency, Washington, D.C. Water Quality Office.
For primary bibliographic entry see Field 05G.
W71-13037

NATIONAL CONTINGENCY PLANNING,
Coast Guard, Washington, D.C. Law Enforcement Div.
For primary bibliographic entry see Field 05G.
W71-13038

INTERNATIONAL ACTIVITY REGARDING SHIPBOARD OIL POLLUTION CONTROL,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-13039

THE OIL POLLUTION PROBLEM FROM THE VIEWPOINT OF MARINE INSURANCE,
Haight, Gardner, Poor and Havens.
For primary bibliographic entry see Field 05G.
W71-13040

SHOULD FINANCIAL LIMITATIONS UPON LIABILITY BE APPLIED TO OIL SPILL REMOVAL AND DAMAGE,
Coast Guard, Washington, D.C. Law Div.
For primary bibliographic entry see Field 05G.
W71-13041

THE MAINE LAW - A PRECURSOR FOR THE OIL TERMINALING STATES,
Maine Environmental Improvement Commission, Augusta.
For primary bibliographic entry see Field 05G.
W71-13042

STATE JURISDICTION OVER OIL SPILLS IN A FEDERAL SYSTEM,
Rhode Island Univ., Kingston. Dept. of Political Science.
For primary bibliographic entry see Field 05G.
W71-13043

A JOINT STATE - INDUSTRY PROGRAM FOR OIL POLLUTION CONTROL,
Little (Arthur D.), Inc., Cambridge, Mass. Div. of Water Pollution Control.
For primary bibliographic entry see Field 05G.
W71-13052

CALIFORNIA CONTINGENCY PLAN FOR OIL AND OTHER HAZARDOUS MATERIAL SPILLS,
California State Div. of Oil and Gas, Sacramento.
For primary bibliographic entry see Field 05G.
W71-13056

AN INTEGRATED PROGRAM FOR OIL SPILL CLEANUP,
Esso Research Centre, Abingdon (England); Esso Petroleum Co. Ltd., London (England).
For primary bibliographic entry see Field 05G.
W71-13090

THE STATE'S ROLE IN OIL SPILL CLEANUP,
Epro Oceanographic Inst., and Marsan Corp., Elgin, Ill.
For primary bibliographic entry see Field 05G.
W71-13094

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION--COASTAL FLOODING, TOWN OF WACHAPREAGUE, VIRGINIA.
Corps of Engineers, Norfolk, Va.
For primary bibliographic entry see Field 04A.
W71-12287

FLOOD PLAIN INFORMATION, CALFKILLER RIVER, SPARTA, TENNESSEE.
Corps of Engineers, Nashville, Tenn.
For primary bibliographic entry see Field 04A.
W71-12288

FLOOD PLAIN INFORMATION, McDOWELL COUNTY, NORTH CAROLINA--VOLUME 1. CATAWBA RIVER AND MILL CREEK.
Corps of Engineers, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W71-12293

FLOOD PLAIN INFORMATION, UMATILLA RIVER TRIBUTARIES, McKAY, TUTUILLA AND WILDHORSE CREEKS, PENDLETON, OREGON AND VICINITY.
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 04A.
W71-12294

FLOOD PLAIN INFORMATION, MUD LICK CREEK AT ROANOKE, VIRGINIA.
Corps of Engineers, Wilmington, N.C.
For primary bibliographic entry see Field 04A.
W71-12361

FLOOD PLAIN INFORMATION OF SAN MARCOS CREEK, VICINITY OF SAN MARCOS, SAN DIEGO COUNTY, CALIFORNIA.
Corps of Engineers, Los Angeles, Calif.
For primary bibliographic entry see Field 04A.
W71-12362

FLOOD PLAIN INFORMATION, MONUMENT CREEK, COLORADO SPRINGS, COLORADO.
Corps of Engineers, Albuquerque, N.Mex.
For primary bibliographic entry see Field 04A.
W71-12667

FLOOD PLAIN INFORMATION, LODGEPOLE CREEK, SIDNEY, NEBRASKA.
Corps of Engineers, Omaha, Nebr.

For primary bibliographic entry see Field 04A.
W71-12668

FLOOD PLAIN INFORMATION, CLINTON COUNTY, PENNSYLVANIA, WEST BRANCH SUSQUEHANNA RIVER AND BALD EAGLE CREEK (LOCK HAVEN AREA).
Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W71-12784

FLOOD PLAIN INFORMATION, McCAIN CREEK AND GILMER BAYOU, SHREVEPORT, LOUISIANA.
Corps of Engineers, New Orleans, La.
For primary bibliographic entry see Field 04A.
W71-12785

FLOOD PLAIN INFORMATION, PALO DURO AND TIERRA BLANCA CRREKS, CANYON, TEXAS.
Corps of Engineers, Tulsa, Okla.
For primary bibliographic entry see Field 04A.
W71-12786

FLOOD PLAIN INFORMATION, MONOCACY RIVER, FREDERICK COUNTY, MARYLAND.
Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W71-12787

FLOOD PLAIN INFORMATION, LEON CREEK, SAN ANTONIO, TEXAS.
Corps of Engineers, Fort Worth, Tex.
For primary bibliographic entry see Field 04A.
W71-12788

HYDROMORPHOLOGICAL INVESTIGATIONS OF FLOOD PLAIN AND CHANNEL PROCESSES (Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protsessov).
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12843

USE OF AERIAL PHOTOGRAPHY FOR EVALUATING THE FLOODING AND DISCHARGE OF RIVER FLOOD PLAINS AND THE DEVELOPMENT OF FLOODPLAIN FLOWS (Primeneniye aerofotos'yemki k otsenke protsessov zatopleniya i oporozhneniya rechnykh poym i razvitiya poymennykh techeniy),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W71-12844

ON-SITE INVESTIGATIONS OF THE HYDRAULICS OF A FLOOD PLAIN DURING A PERIOD OF VERY HIGH WATER (Naturnyye issledovaniya gidravliki poymennogo massiva v vysokoye polovod'ye),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12845

AN EXPERIMENTAL STUDY OF THE HYDRAULICS OF FLOOD-PLAIN CHANNELS IN LIMITED MEANDERING (Eksperimental'noye issledovaniye gidravliki poymennykh rusel pri ogranichennom meandrirovanii),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12846

6G. Ecologic Impact of Water Development

NEW CONCEPT FOR MANAGING AQUATIC LIFE SYSTEMS,
Virginia Polytechnic Institute and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 06B.
W71-12305

GROUND DISPOSAL OF PESTICIDES: THE PROBLEM AND CRITERIA FOR GUIDELINES.
Working Group on Pesticides, Rockville, Md.
For primary bibliographic entry see Field 05E.
W71-12356

PROTECTING THE BIOSPHERE FROM TOXIC CHEMICALS,
Ministerstvo Zdravookhraneniya, USSR, Leningrad. Inst. of Biophysics.
S. D. Zaugol'mikov, and M. M. Kochanov.
Originally published in Priroda, Moscow, USSR, No 8, p 24-27, 1970. Available as JPRS 52325 from National Technical Information Service, Springfield, Va 22151. In: The Biosphere-USSR, Joint Publications Research Service 52325, p 15-22, February 4, 1971. 8 p, 7 ref.

Descriptors: *Ecology, *Environmental gradient, *Pollution abatement, *Chemicals, *Toxicity, Water pollution, Air pollution, Soil contamination, Pathology.
Identifiers: *Toxic chemicals, *Environmental pollution, Biosphere.

The February 1970 general assembly of the Academy of Sciences USSR, in discussing the problems of technological progress, devoted special attention to the problems connected with the protection of the biosphere. This concern is dictated by the threat to mankind of environmental pollution and depletion of natural resources. The Soviet hygiene has priority in the analysis of the PDK (maximum permissible concentration) of substances. The PDK serves as the basis for the quantitative evaluation of environmental pollution. Experimental analyses made it possible to establish scientifically the PDK of 403 substances in the air of work areas, of 177 substances in reservoir water used for sanitation and general consumption, and of 96 substances in the atmosphere of populated areas. Norms have been recommended for the maximum permissible amount of nontoxic pesticides entering the air, water, and food. (Woodard-USGS)
W71-12471

THE BIOSPHERE AND MAN,
Ministerstvo Zdravookhraneniya, USSR, Moscow. Inst. of Biomedical Problems.
N. V. Timofeyev-Resovskiy.
Originally published in Priroda, Moscow, USSR, No 8, p 2-9, 1970. Available as JPRS 52325 from National Technical Information Service, Springfield, Va. 22151. In: The Biosphere-USSR, Joint Publications Research Service 52325, p 1-14, February 4, 1971. 14 p, 2 tab.

Descriptors: *Ecology, *Environmental gradient, *Earth (Planet), *Biomass, *Pollution abatement, Productivity, Water pollution, Air pollution, Soil contamination, Ecological distribution.
Identifiers: *Biosphere, *Environmental pollution.

The productivity potential of the biosphere to insure natural balance is discussed. The basic function of the biosphere is to maintain planetary equilibrium on the surface of the earth. The normal biogeochemical functioning of the biosphere maintains the equilibrium of the atmospheric gas composition and, most important, the normal composition of natural water. One of the first scientific problems that can be solved is the mathematical simulation of the types of very complicated equilibrium in biogeocenoses and then the simulation of some states of equilibrium of a higher order in interaction with many spatially neighboring biogeocenoses. The first rule for human survival on earth is not to decrease the average density of the earth's green mantle, but rather employ all measures to increase it, since it increases the primary biological productivity of the biosphere in direct proportion. (Woodard-USGS)
W71-12472

HEALTH ASPECTS OF THE ENVIRONMENT,
Gezondheidsorgasatie, TNO, The Hague (Netherlands).
For primary bibliographic entry see Field 05C.
W71-12570

THE ENGINEER AND THE ENVIRONMENT,
Minnesota Univ., Minneapolis. Water Resources Research Center.
R. W. Burwell, C. I. McGinnis, E. R. Allred, W. J. Ochs, and B. W. Rounds.
Available from the National Technical Information Service as PB-202 853, $3.00 in paper copy, $0.95 in microfiche. Univ. of Minnesota, Water Resources Research Center. Bull 38, 1971. 49 p. OWRR A-999-MINN (21).

Descriptors: *Environment, *Planning, *Water resources development, Ecology, Wildlife, Minnesota, Water resources projects, Drainage, Nutrients, Institutions, Water pollution, Attitudes, Wetlands, Decision-making, *Engineering personnel.
Identifiers: *Social decisions, *Public attitudes, Awareness.

This publication contains the papers presented at the 'Seminar on the Engineer and the Environment', presented by the Department of Conferences and Institutes of the General Extension Division of the University of Minnesota. The seminar was planned in cooperation with the Northwest Section of the American Society of Civil Engineers. The purpose of the seminar was to inform engineers of current environmental issues, with particular emphasis being placed on water resources problems. The planning for the conference was based on the premise that the engineering profession should be aware that environmental issues are of paramount concern to society and that the profession is responsible for giving full consideration to these issues in addition to fulfilling the traditional role of solving purely technical problems. The subjects of the papers are: An Ecological Approach to Natural Resource Problems; Drainage and the Environment; Environmental Aspects of Water Resources Planning and Development; Social Aspects of Ecology; The State Concern in Engineering Planning for Water Resources; and The Challenge of Environmental Concerns in the Future of Engineering. (Walton-Minnesota)
W71-12692

MAN AND HIS ENVIRONMENT '68,
Michigan Natural Resources Council, East Lansing.
For primary bibliographic entry see Field 05G.
W71-12760

PROTECTING THE WORLD ENVIRONMENT IN THE LIGHT OF POPULATION INCREASE.
Executive Office of the President, Office of Science and Technology, Washington, D.C.

Report to the President, December 1970, 36 p.

Descriptors: *Human population, *Growth rates, *Water pollution treatment, *Waste dilution, Distribution patterns, Balance of nature, Ecology, Environmental effects, Eutrophication, Productivity, Social aspects, Environment, Air pollution, Solid wastes, Natural resources, Water resources, Water pollution, Water pollution sources, Pollution abatement, Sewage treatment, United States, Governments, Political aspects.

This report was the result of an interagency study made to develop means to safeguard the world environment in light of population increases. It discusses population growth and the resulting increased need for resources. The impact of the increased numbers of men on land, water, plant, and animal resources, and particularly on the environmental quality is detained. In addition to the effects of increased air pollution and disposal of solid wastes, the problems of water pollution are examined. It was found that the growing population uses and wastes more products, increasing pollution from agricultural, industrial, and domestic sources. There is no longer enough dilution of wastes by river systems to allow their use as a means of disposal. Treatment and abatement of water pollution is costly and some treatment methods, such as secondary sewage treatment, are not completely effective. The report discusses the need of both developing and industrialized nations to be aware of the environmental complications of their actions, concluding with ten recommendations for United States action to help improve the world environment. (Johnson-Florida)
W71-12763

REPORT TO THE PRESIDENT AND TO THE COUNCIL ON ENVIRONMENTAL QUALITY.
Citizens' Advisory Committee on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-12773

AN ACT TO PROTECT THE NATURAL ENVIRONMENT.
For primary bibliographic entry see Field 05G.
W71-12781

A PRELIMINARY STUDY OF THE RELATIONSHIP OF SALT-PONDS AND WILDLIFE--SOUTH SAN FRANCISCO BAY,
California Dept. of Fish and Game, Sacramento.
William Anderson.
Calif Fish Game. 56 (4): 240-252. Illus. 1970.
Identifiers: Bay, Coots, Ducks, Grebes, Larus-Philadelphia, Phalarope, Ponds, Relationship, Salt, San-Francisco, South, USA, Wildlife.

Five salt evaporation ponds in Alameda County were evaluated as wildlife habitat. Data were collected from Sept. 1967 to Sept. 1969. Salinity ranged from 9 Sal. (percent of saturation) as the minimal in Pond 1 to a maximum of 93 Sal. in Pond 6. Fifty-five bird spp. were recorded in the ponds. Among the birds making heavy use of salt ponds were shorebirds, ducks, grebes, and Bonaparte's gulls Larus philadelphia. Dabbling ducks, coots and fish-eating birds exhibited a marked preference for Pond 1. Diving ducks, grebes, phalaropes and Bonaparte's gulls disclosed a high degree of salinity tolerance and predilection for food items existing in ponds of high salinity. Shorebirds, except phalaropes, made heaviest use of ponds almost regardless of salinity and which were sufficiently shallow for wading.--Copyright 1971, Biological Abstracts, Inc.
W71-12947

BIRDLIFE IN WATER-FILLED CLAY PITS IN THE UPPSALA AREA, CENTRAL SWEDEN,
Kjell Sjoberg.
Var Fagelvaerld. 28 (3/4): 177-193. Illus. 1969 (Engl summ).
Identifiers: Apus-Apus, Birdlife, Central, Clay, Columba-Oenas, Columba-Palumbus, Delichon-Urbica, Filled, Philomachus-Pugnax, Pits, Riparia-Riparia, Sturnus-Vulgaris, Sweden, Tringa-Glareola, Uppsala, Water.

Bird species visiting 8 water-filled clay pits in an agricultural area near Uppsala included migrating Tringa glareola, Philomachus pugnax, Apus apus, Riparia riparia, Sturnus vulgaris, Delichon urbica, Columba palumbus and C. oenas. Altering water depths, placing nest boxes and improving other conditions of the ponds are believed to increase and encourage the number of visiting birds in the area.--Copyright 1971, Biological Abstracts, Inc.
W71-12948

HIGHER AQUATIC PLANTS IN THEIR ENVIRONMENT: A NEW ORIENTATION,
Limnologische Station Niederrhein in der Max-Planck-Gesellschaft z.F.d.W., Krefeld (West Germany).
For primary bibliographic entry see Field 02I.
W71-12959

THE ECOSYSTEM CONCEPT IN NATURAL RESOURCE MANAGEMENT,
For primary bibliographic entry see Field 04A.
W71-12960

IODINE AND THYROID DISEASE IN LATIN AMERICA,
Massachusetts Inst. of Tech, Cambridge.
For primary bibliographic entry see Field 05C.
W71-12979

THE SEASONS: LIFE AND ITS RHYTHMS,
For primary bibliographic entry see Field 02A.
W71-13025

07. RESOURCES DATA

7A. Network Design

HOURLY RAINFALL SYNTHESIS FOR A NETWORK,
Hydrocomp International, Palo Alto, Calif.
For primary bibliographic entry see Field 02B.
W71-12259

POTOMAC RIVER WATER QUALITY NETWORK, WATER YEAR 1970.
Interstate Commission on the Potomac River Basin, Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-12363

RATIONALIZATION OF A SNOW MEASUREMENT NETWORK,
I. D. Kopanev.
Translated from Transactions of the Voyeykov Main Geophysical Observatory (Trudy GGO), No. 244, 1969, pp. 7-14. Soviet Hydrology: Selected Papers, No 6, p 555-560, 1969. 6 p, 1 tab, 8 ref.

Descriptors: *Snow surveys, *Snowpacks, *Network design, *Water yield, *Snow management, Instrumentation, Snowmelt, Runoff forecasting, Streamflow forecasting, Economics, Gaging stations.
Identifiers: *USSR, *Belorussia.

The main source knowledge of snow cover in the USSR is direct observations at the hydrometeorological network. Systematic snow cover observations were initiated in 1892. Later, in the 1930's, observations on permanent snow stakes were supplemented by snow surveys. In 1914, the Russian snow measurement network consisted of 1400 stations and 1500 posts. Now, snow measurements are made at 3450 stations and 7200 posts. Measurements include daily determination of snow distribution, snow surveys, special observations of soil ice crusts, daily observations of solid precipitation, and observations of snow avalanches. In rationalizing a snow measurement network, the problem of net density must be determined not only by economics, but also by need for accurate determination of snow cover characteristics. Computations based on data obtained from experimental snow surveys show that a snow measurement accuracy within 5-10% can be achieved in Belorussia by: (a) taking 100 snow depth and 20 snow density measurements on 2-km long snow courses in fields, and (b) taking 50 snow depth and 5 snow density measurements in forest snow courses 0.5 km long. The rational distance between stations in Belorus-sia should be 20 to 25 km. In the southwestern part of Belorussia the stations must be spaced not more than 15 km apart because of frequent warm spells and precipitation. Therefore, the optimum permanent snow measurement network in Belorussia should consist of 150 stations instead of the present 226. (Knapp-USGS)
W71-12394

THE W.A.T.E.R. SYSTEM: COMPUTER PROGRAMS FOR STREAM NETWORK ANALYSIS,
Purdue University, Lafayette, Ind. Water Resources Research Center.
D. M. Coffman, A. K. Turner, and W. N. Melhorn.
Available from the National Technical Information Service as PB-202 863, $3.00 in paper copy, $0.95 in microfiche. Indiana Water Resources Research Center, Lafayette, Publication No. 16, June 1971. 235 p, 23 fig, 5 tab, 63 ref, 5 append. OWRR A-007-IND (4).

Descriptors: *Drainage systems, *Geomorphology, *Drainage density, *Channel morphology, *Computer programs, Stream erosion, Meanders, River basins, River systems, *Networks, Network design, Data collections, Data processing.
Identifiers: *Stream network, *Stream order, Strahler stream order, Bifurcation ratio, Relief ratio, Stream classification, Horton stream order.

The development of quantitative fluvial research has been closely tied with the classification of stream network. Historically, both qualitative and quantitative systems of stream classification have evolved in response to ever-changing needs and scientific environment. All current classifications, however, are based solely on the channel network topology whereas the geometry, hydrology, water budget, form and fabric of the drainage basin are ignored. Another problem with current methods of stream description is the amount of computation necessary to ascertain the characteristics of streams of any given class. Thus, these advanced research systems are rarely used in applied stream studies. The WATER System is presented as a computer augmented method for collection, storage, and analysis of real river networks. Its purpose is to facilitate the application of advanced fluvial analysis to actual problems of water management and river control. Data are collected so that geometry as well as topology of a stream is preserved, permitting calculation of all common drainage basin statistics such as area, shape, orientation, and texture. Classification of segments and statistical comparisons of the properties of the various classes are automatically performed.
W71-12689

MORE ON PLANNING EXPERIMENTS TO INCREASE RESEARCH EFFICIENCY,
Allied Chemical Corp., Buffalo, N.Y. Specialty Chemicals Div.
William J. Hill, and Walter R. Demler.
Industrial and Engineering Chemistry, Vol 62, No 10, p 60-65, October 1970. 4 fig, 6 tab, 20 ref.

Descriptors: *Statistical methods, *Statistical models, Evaluation, Model studies, Regression analysis.
Identifiers: *Experimental design, *Statistical design, Statistical analysis, Data interpretation.

The purpose of this paper is to show, by a case history, the value and simplicity of using statistical designs in research situations involving variable screening and optimization: The point stressed here is that once the experiments are well planned, as in a statistical design, the analysis of the data is very often straightforward and leads to informative results. This is because, with many statistical designs, the experiments are patterned in such a way as to concentrate on the information associated with the variables, and to provide an easy

interpretation of the experimental results. However, with classical one-variable-at-a-time experimentation the task is usually much more difficult. If the experiments are poorly planned, the information on the variables and their interactions probably isn't there; even if the information is present, the pattern of the experiments may make for difficult interpretation. A combination of limited information and difficulty in interpretation can lead to overall inefficiency in the experimental method. The fact that statistical designs help to avoid these hazards is perhaps reason enough for their application. (Mortland-Battelle)
W71-12710

7B. Data Acquisition

PRELIMINARY IONIUM DATE FROM MARINE TERRACE, FLORIDA,
Florida State Univ., Tallahassee. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W71-12263

HYDROLOGIC EVALUATION OF GEMINI PHOTOGRAPHS OF FRINGES OF THE SAHARA, AFRICA,
Geological Survey, Washington, D.C.
J. R. Jones.
Available as N70-389929 from Nat. Tech. Inf. Service, Springfield, Va. 22151--price $3.00 printed copy--$0.95 microfiche. National Aeronautics and Space Administration Technical Letter, NASA-68, 1970. 13 p, 6 fig. NASA Contract No. R-09-020-013.

Descriptors: *Aerial photography, *Photogrammetry, *Hydrology, Topography, Oceans, Land, Deserts, Rivers, Mountains, Paleohydrology.
Identifiers: *Aerial photography (Space-craft), *Africa, *Photogrammetry (Gemini).

Five Gemini photographs of part of Africa, including one from Gemini IV, three from Gemini V, and one from Gemini IX, are evaluated for their content of information of hydrologic significance. Geographic, geomorphic, and geologic features are annotated on overlays. Outstanding features clearly displayed in the photos include the paleohydrologic (transitional) nature of the eastern shore of Lake Chad; topographic and color manifestations of geology near the Atlantic Coast of Morocco, and the hydrologic control on location of towns in that region (37 towns were located in one photograph); the sharp contrast between the water-rich Nile Delta and adjacent desert; the disappearance of the Jabal Nafusah escarpment in Libya; and the intricate drainage patterns of the flat-lying beds which form the Jabal Nafusah. (Woodard-USGS)
W71-12279

SOME SEISMIC MEASUREMENTS ON THE VIRGINIA COASTAL PLAIN,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02F.
W71-12323

THE INSTANTANEOUS UNIT HYDROGRAPH: ITS CALCULATION BY THE TRANSFORM METHOD AND NOISE CONTROL BY DIGITAL FILTERING,
Purdue Univ., Lafayette, Ind. School of Civil Engineering
For primary bibliographic entry see Field 02A.
W71-12330

SEISMIC SURVEY LOCATES POTENTIAL GOLD DEPOSITS IN THE BERING SEA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02L.
W71-12358

DESCENT RATES OF SALT FINGERS,
Wisconsin Univ., Milwaukee. Dept. of Civil Engineering.
Theordore Green, III, and Robert G. Kirk.
Nature Physical Science, Vol 232, No 32, p 123-124, August 9, 1971. 2 p, 1 fig, 1 tab, 6 ref.

Descriptors: *Saline water-freshwater interfaces, *Convection, *Mixing, *Salinity, Density, Density stratification, Sea water, Water chemistry, Viscosity, Water temperature, Boundaries (Surfaces).

Salt fingers sometimes occur when a salty layer of water overlies a colder, fresher layer. Slender columns of liquid move vertically across the interface, driven by the potential energy due to the salinity difference. To study this process, a sharp interface was created artificially, and the descent rates of newly formed salt fingers were observed over a range of layer temperatures and salinities. Substandard seawater of 34.928% salinity, diluted with tap water, was used for the saline solutions. After two layers were carefully injected separating them and allowed to come to rest, the glass plate was slowly slid away. Photographs and stopwatch measurements of the ensuing fingers were taken at intervals from 15 s to 3 min. The thermometers were read each 2 min, to the nearest 0.05 deg C. Twenty-five useful runs were made. A sharp discontinuity remained for several seconds (up to a minute when the salinity difference between the layers was small). The ensuing fingers were between 1 and 2 mm thick, well defined, and very slow to descend. They usually diffused and lost their identity before reaching the bottom. When the salinity difference was large, the fingers were only slightly thicker, but both formed and sank much more rapidly. (Woodard-USGS)
W71-12359

FIELD MEASUREMENT OF SOIL-WATER CONTENT BY GAMMA-RAY TRANSMISSION COMPENSATED FOR TEMPERATURE FLUCTUATIONS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 02G.
W71-12376

PESTICIDE ADSORPTION MEASUREMENT BY FLOW EQUILIBRATION AND SUBSEQUENT DISPLACEMENT,
du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Lab.
For primary bibliographic entry see Field 05A.
W71-12380

PHOTO-INTERPRETATION STUDIES IN THE LOCATION OF PRAIRIE GROUNDWATER SUPPLIES,
Mollard (J.D.) and Associates Ltd., Regina (Saskatchewan).
J. D. Mollard.
Canadian Geotechnical Journal, Vol 7, No 2, p 127-135, May 1970. 6 tab, 17 ref.

Descriptors: *Surveys, *Aerial photography, *Groundwater, *Water supply, *Hydrogeology, Terrain analysis, Topography, Aquifers, Remote sensing, Geologic investigations, Exploration, Water yield, Mapping, Water resources development, Grasslands.
Identifiers: *Canada.

Photo-interpretation studies were applied to hydrogeological investigations in the Prairie provinces of Western Canada. Most of these studies involved the search for previously unknown commercial sources of groundwater in southern Saskatchewan and Alberta. Performance records reported cover the 13-year period from 1956 to 1969. Interpretation of hydrogeological environments was 90% successful using conventional black-and-white aerial photography. Follow-up field data are available on 127 projects, which include 84 groundwater development investigations, pump testing, data analysis, and evaluation of safe yield. Airphoto interpretation techniques proved helpful in correctly identifying commercial sources of groundwater in approximately 7 out of 10 projects. About half of the water sources were required for urban use and about one-quarter were required for a variety of industrial uses. Also, roughly half of the studies involved finding 45.5 to 272.8 liters/min and roughly half involved finding 272.8 to 9092 liters/min. Less frequently, the groundwater studies dealt with regional mapping of the surficial and bedrock hydrogeology, with setting up monitoring systems for the detection and surveillance of groundwater contamination, and with locating small groundwater supplies. (Knapp-USGS)
W71-12391

A FLUOROMETRIC TECHNIQUE FOR SAMPLING IN LARGE-RIVER ECOSYSTEMS,
Michigan State Univ., Lansing. Dept. of Fisheries and Wildlife; and St. Marys Coll., Winona, Minn. Dept. of Biology.
For primary bibliographic entry see Field 02E.
W71-12421

NEW METHODS OF MEASURING WATER EQUIVALENT OF SNOW PACK FOR AUTOMATIC RECORDING AT REMOTE MOUNTAIN LOCATIONS,
Idaho Univ., Moscow. Engineering Experiment Station.
For primary bibliographic entry see Field 02C.
W71-12460

MISCIBLE DISPLACEMENT MEASUREMENTS WITHIN LABORATORY COLUMNS USING THE GAMMA-PHOTONEUTRON METHOD,
du Pont de Nemours and Co., Aiken, S.C., Savannah River Lab.
For primary bibliographic entry see Field 02G.
W71-12578

REMOTE DETECTION OF MOISTURE STRESS: FIELD AND LABORATORY EXPERIMENTS,
Iowa State Water Resources Research Inst; Ames.
For primary bibliographic entry see Field 02I.
W71-12582

REMOTE SENSING OF OIL SPILLS,
Coast Guard, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 05G.
W71-12589

IDENTIFICATION OF OIL LEAKS AND SPILLS,
Standard Oil of California, San Francisco.
For primary bibliographic entry see Field 05A.
W71-12590

THE BEHAVIOR OF OIL ON WATER DERIVED FROM AIRBORNE INFRARED AND MICROWAVE RADIOMETRIC MEASUREMENTS,
TRW Systems, Houston, Tex.
For primary bibliographic entry see Field 05B.
W71-12593

RADIUS OF INVESTIGATION IN DC RESISTIVITY WELL LOGGING,
National Geophysical Research Inst., Hyderabad (India).
For primary bibliographic entry see Field 04B.
W71-12602

NUCLEAR WELL LOGGING IN HYDROLOGY.
For primary bibliographic entry see Field 02F.
W71-12616

LOGGING METHODS - A. NATURAL GAMMA LOGGING,
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
For primary bibliographic entry see Field 02F.
W71-12617

LOGGING METHODS - C. NEUTRON LOGGING,
Institute of Nuclear Research. Krakow (Poland).
For primary bibliographic entry see Field 02F.
W71-12618

LOGGING METHODS - B. GAMMA-GAMMA LOGGING,
Institute of Nuclear Research. Krakow (Poland).
For primary bibliographic entry see Field 02F.
W71-12619

LOGGING METHODS - D. TRACER LOGGING,
Bhabha Atom Research Centre, Bombay (India).
For primary bibliographic entry see Field 02F.
W71-12620

METHODS AND INSTRUMENTS, A NEW TEMPERATURE-DEPTH PROBE,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
B. V. Shekhvatov, and E. V. Suvilov.
Oceanology (USSR), Vol 10, No 2, p 273-277, November 1970. 5 p, 6 fig, 4 ref.

Descriptors: *Instrumentation, *Bathythermographs, Bathymetry, *Water temperature, Telemetry, Oceanography, Data collections.

A temperature-depth probe using frequency modulation is described. The instrument is designed for measurement of the vertical distribution of water temperature in the ocean to depths of 1-5 km; the measuring accuracy is 0.25% in depth and 0.1 deg in temperature over the temperature range of 0 deg to ..30 deg C. A single-strand cable provides the data link with the ship. Measurements are recorded in analog and digital formats. Diagrams of the probe and on-board equipment are given, together with some data obtained with the instrument. (Knapp-USGS)
W71-12637

POSSIBILITY OF DETERMINING THE CONCENTRATION OF SUSPENDED MATTER BY AN OPTICAL METHOD,
Akademiya Nauk SSSR, Moscow. Institut Okeanologii
A. N. Maksimov, and M. M. Shlafman.
Oceanology (USSR), Vol 9, No 4, p 565-569, 1970. 5 p, 2 fig, 1 tab, 9 ref.

Descriptors: *Suspended load, *Turbidity, *Analytical techniques, *Instrumentation, *Optical properties, Sea water, Light intensity, Photometry, Water quality, Light penetration.
Identifiers: Turbidimeters.

A method is suggested for determining the concentration of suspended matter in sea water from values of the attenuation coefficients for light at two wavelengths. Curves for gradiations of concentration were constructed. The rather laborious determination of the concentration of suspended matter by weighing of filters is simplified by this method, which also makes possible the elimination of the calculation of particle diameter in the determination of the concentration of suspended matter from the light attenuation coefficients. (Knapp-USGS)
W71-12646

CHEMICAL GAUGING OF STREAMFLOW,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 02E.
W71-12664

GEOPHYSICAL DATA RELATING TO A POSSIBLE PLEISTOCENE OVERFLOW OF LAKE BONNEVILLE AT GEM VALLEY, SOUTHEASTERN IDAHO,
Geological Survey, Denver, Colo.
D. R. Mabey.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B122-B127, 1971. 6 fig, 7 ref.

Descriptors: *Geophysics, *Electrical studies, *Paleohydrology, *Idaho, *Lakes, Pleistocene epoch, Streams, Paleolimnology, Discharge (Water), Topography, Water levels, Rivers, Surveys, Electrical resistance.
Identifiers: *Lake Bonneville.

Electrical resistivity soundings and aeromagnetic surveys in Gem Valley, Idaho, an area covered by Pleistocene basalt flows, are interpreted as indicating that (1) prior to the flooding of the valley by basalt flows the south end of the valley was a topographic low and (2) a broad channel along the west side of the valley reached north to the Portneuf River canyon. The base of this channel is now about 5,100 feet above sea level, which is slightly lower than the level of Lake eville at the time of the initial overflow at Red Rock Pass. The concealed topography beneath the basalt suggests that drainage of the south end of the valley was, as it is now, south through the Oneida Narrows into the Lake Bonneville basin. If the Oneida Narrows were open before Gem Valley was flooded by basalt flows, the low point in the rim of the Lake Bonneville basin may have been at the head of the Portneuf River canyon, and overflow may have occurred through the Portneuf River. Blocking of this drainage by basalt flows could have produced a rise in the lake level and overflow at Red Rock Pass. (Knapp-USGS)
W71-12671

THERMAL INFRARED DETECTION OF GLACIAL GRAVEL, YELLOWSTONE NATIONAL PARK, WYOMING,
Geological Survey, Denver, Colo.
H. A. Waldrop.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B202-B206, 1971. 2 fig, 1 tab, 5 ref.

Descriptors: *Remote sensing, *Infrared radiation, *Wyoming, *Glacial drift, *Vegetation effects, Solar radiation, Temperature, Aerial photography, Forests, Gravels, Slopes, Terrain analysis.
Identifiers: *Yellowstone National Park, Infrared imagery.

Well-drained glacial gravel in Yellowstone National Park can be distinguished from bedrock and till by its darker tone on evening thermal infrared imagery. Well-drained gravel supports relatively thin forest, which cools more rapidly at night and which shows a darker infrared tone than thicker forest on different materials. Other conditions that produce dark infrared tone must be considered, but in the report area the dark-tone anomaly is a useful reconnaissance aid in outlining probable deposits of glacial gravel. Hydrothermal activity registers directly on thermal infrared imagery; other geologic features in Yellowstone National Park register indirectly by their topographic expression, which is often more evident on radar imagery and vertical aerial photographs. (Knapp-USGS)
W71-12672

THE UNIT HYDROGRAPH - A TECHNIQUE FOR ROUTING RESERVOIR RELEASES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W71-12682

A METHOD OF CALCULATING PERMEABILITY FROM ELECTRIC LOGS,
Geological Survey, Bismarck, N. Dak.
M. G. Croft.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B265-B269, 1971. 4 fig, 1 tab, 7 ref.

Descriptors: *Aquifer characteristics, *Permeability, *Electrical well logging, *Transmissivity, Water wells, Particle size, Water chemistry, Hydrogeology.
Identifiers: Resistivity logs.

A method is described for calculating permeability and transmissivity from resistivity curves of electric logs of water wells. The transmissivity calculated from electric logs was reasonably accurate when compared with aquifer tests at two sites. The method should prove useful for the construction of transmissivity maps in areas where electric logs of water wells are abundant. The relationship of grade-sized samples to formation factor and permeability is presented in graph form. The graph can be used to estimate the transmissivity of an aquifer with the resistivity multiple-electrode curves. (Knapp-USGS)
W71-12683

THE USE OF WELL LOGGING IN RECHARGE STUDIES OF THE OGALLALA FORMATION IN WEST TEXAS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 04B.
W71-12684

MEASUREMENT AND INTERPRETATION OF PHYSICAL PROPERTIES OF SOILS,
Oregon State Univ., Corvallis. Dept. of Soils.
For primary bibliographic entry see Field 02G.
W71-12686

INCIDENCE OF PROSTHECATE BACTERIA IN A POLLUTED STREAM,
Michigan State Univ., East Lansing. Dept. of Microbiology and Public Health.
For primary bibliographic entry see Field 05C.
W71-12698

A BUBBLER-MANOMETER WATER LEVEL SENSING AND RECORDING SYSTEM,
Saskatchewan Research Council, Saskatoon.
B. Morrison, and W. A. Meneley.
Canadian Geotechnical Journal, Vol 8, No 3, p 425-433, August 1971. 5 fig, 4 ref.

Descriptors: *Stream gages, *Water levels, *Water measurement, *Instrumentation, Data collections, Hydrologic data.
Identifiers: *Water level recorders, Bubble-gages.

A bubbler-manometer water level sensing and recording system for observation wells and stream stage hydrometric stations can produce continuous hydrographs throughout winter and summer seasons in observation wells and hydrometric stations. The system utilizes a conventional recorder which operates unattended for a 30-day period. No external energy source is required and the system functions over 100 days on a 224 cu ft bottle of nitrogen. A protective housing is an integral part of the installation so that the instrument can be safely installed whereever required and will operate throughout the winter without requiring any heating. These features, combined with simplicity of construction and functional durability, make this design economically attractive for many locations where it is not possible to sense water level changes directly with a float-operated recorder. (Knapp-USGS)
W71-12805

COMMENTS ON THE STABLE ISOTOPE METHOD IN REGIONAL GROUNDWATER INVESTIGATIONS,
International Atomic Energy agency, Vienna (Austria).
For primary bibliographic entry see Field 02F.
W71-12811

A LABORATORY APPARATUS FOR MAINTAINING UNIFORM SUSPENSIONS OF FINE-GRAINED SEDIMENT,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02J.
W71-12834

SNOW FENCE SHIELDING OF PRECIPITATION GAGES,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 02C.
W71-12837

OPTICAL CURRENT METER USE IN SOUTHERN CALIFORNIA,
Geological Survey, Garden Grove, Calif.
T. S. Chandler, and W. Smith.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, Paper 8390, p 1461-1469, September 1971. 3 fig, 1 tab, 2 ref, append.

Descriptors: *Current meters, *Stream gages, *Instrumentation, Discharge measurement, Discharge (Water), Streamflow, Velocity.
Identifiers: *Current meters (Optical).

The optical current meter is a stroboscopic device with which an operator may visually follow and gage the velocity of particles moving on the water surface. From early prototypes the meter has evolved to a field usable instrument with a low power telescope, an oscillating mirror in the line of sight of the telescope, a variable-speed battery-powered motor, and a tachometer which indicates the rotational speed of the mirror. Surface velocities are computed knowing the distance to the water surface and the angular speed of the oscillating mirrer. Surface velocities must be corrected by an appropriate coefficient to represent the mean velocity in the vertical. The optical current meter will find its principal use in measurements of discharge under conditions that preclude use of conventional stream-gaging equipment. (Knapp-USGS)
W71-12838

USE OF AERIAL PHOTOGRAPHY FOR EVALUATING THE FLOODING AND DISCHARGE OF RIVER FLOOD PLAINS AND THE DEVELOPMENT OF FLOODPLAIN FLOWS (Primeneniye aerofotos'yemki k otsenke protsessov zatopleniya i oporozhneniya rechnykh poym i razvitiya poymennykh techeniy),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W71-12844

A COMPARISON OF A SIMPLE CORER AND AN EKMAN GRAB FOR SAMPLING SHALLOW-WATER BENTHOS,
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 05A.
W71-12866

STATISTICAL MODEL FOR THE SELECTION OF UNICELLULAR ALGAL STRAINS BY THE RATE OF INCREASE IN NUMBERS (Statisticheskaya model otbora shtammov odnokletochnykh vodoroslei po skorosti uvelicheniya chislennosti),
Agrofizicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
I. A. Shvytov.
English summary, Zhurnal Obshchei Biologii, Vol 32, No 3, p 260-265, 1971. 2 tab, 5 ref.

Descriptors: *Model studies, *Statistical methods, *Algae, Cytological studies, Selectivity, Productivity.
Identifiers: Algal growth.

The genetic selection aims to isolate cells from a large phenotypic population that belong to a definite genotype of a high productive potential. The introduced statistical model for the competitive selection of two-component microalgal populations predicts that during a long period one of the components will undergo degeneration. The given formulas delineate the probabilities of elimination of strains in accordance with their specific rate of growth and the initial densities. A predominance of cells of inferior strains may cause degeneration of the rapidly growing cells. (Wilde-Wisconsin)
W71-12868

AN INEXPENSIVE METHOD FOR SIMULATING DIEL PATTERNS OF LIGHTING IN THE LABORATORY,
Federal Water Pollution Control Administration, Duluth, Minn. National Water Quality Lab.
For primary bibliographic entry see Field 05C.
W71-12876

THE USE OF SNOW FENCES FOR SHIELDING PRECIPITATION GAGES,
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 02B.
W71-12891

PRODUCER-CONSUMER RELATIONSHIPS IN THE SEA: II. CORRELATION BETWEEN MYTILUS PIGMENTATION AND DENSITY AND COMPOSITION OF PHYTOPLANKTONIC POPULATIONS IN INSHORE WATERS,
Norwegian Inst. of Seaweed Research, Trondheim.
Arne Jensen, and Egil Sakshaug.
J Exp Mar Biol Ecol. 5 (3): 246-253. Illus. 1970.
Identifiers: Automatic, Composition, Consumer, Densities, Density, Dinoflagellates, Inshore, Mytilus, Mytilus-Edulis, Phyto, Pigmentation, Plankton, Planktonic, Populations, Producer, Relationships, Sampler, Sea, Water, Waters.

A simple, automatic water sampler was constructed and used to study in detail the variations in phytoplanktonic densities around populations of the edible mussel (Mytilus edulis L.). Very rapid fluctuations were observed in the plankton counts. A good correlation between these and the total carotenoid content of the mussels was found, together with considerable seasonal variation in the pigmentation of the mussels. Analyses of the pigments strongly indicated that the large dinoflagellates are at least partly assimilated by the edible sea mussel.--Copyright 1971, Biological Abstracts, Inc.
W71-12905

DETERMINATION OF MOVEMENT AND IDENTITY OF STOCKS OF COHO SALMON (ONCORHYNCHUS KISUTCH) IN THE OCEAN USING THE RADIONUCLIDE ZINC-65,
Oregon Fish Commission, Clackamas. Research Div.
Robert E. Loeffel, and William O. Forster.
Res Rep Fish Comm Oreg. 2 (1): 15-27. Maps. 1970.
Identifiers: Coho, Determination, Identity, Migration, Movement, Nuclide, Ocean, Oncorhynchus-Kisutch, Radio, Salmon, Stocks, Zinc-65.

The radioisotope, 65Zn, which occurs in the Columbia River plume because of the Atomic Energy Commission operations at Hanford on the Columbia River, is assimilated by coho and if retained long enough biologically has a sufficient half life (245 days) to serve as a natural mark for coho. Zinc-65 was studied as a marker by comparing 65Zn levels in coho taken along the British Columbia-S. E. Alaska coast during the summer months north of the Columbia River plume, and in the suspected migratory path for Oregon-Washington coho during their 1st few mo. in the ocean Bering Sea coho were included to provide a measure of 65Zn that was not of Hanford origin. Samples were collected by the University of Washington Fisheries Research Institute and were passed on to the Oregon State University Department of Oceanography for radio-analysis. Variation in activity between coho collected in time-space subdivisions within each year was observed. The variation was taken as evidence that coho originating from streams south of the area of collection were in the sample as well as coho from British Columbia and S. E. Alaska. The levels of activity appeared to be high enough that if coho so marked were caught 6 mo. later on the high seas they would be distinguishable from unmarked coho. Most fish contained some 65Zn above background levels, which suggests that 65Zn is carried farther north than the plume appears to take it. The presence of fish with high levels of 65Zn in the northern samples supports the thesis that a northward migration of Oregon-Washington juvenile coho occurs.--Copyright 1971, Biological Abstracts, Inc.
W71-12910

A CRITICAL STUDY OF SENSOR ELEMENT DIFFUSION POROMETERS,
Stirling Univ. (Scotland). Dept. of Biology.
Hans Meidner.
J Exp Bot. 21 (69): 1060-1066. Illus. 1970.
Identifiers: Diffusion, Element, Porometers, Sensor, Temperature.

Improvements in the design, calibration, and method of use of sensor element diffusion porometers (in study of stomatal changes) are described, and the difficulties caused by nonisothermal conditions during the use of these porometers are discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12982

TEMPERATURE COMPENSATED PELTIER PSYCHOROMETER FOR MEASURING PLANT AND SOIL WATER POTENTIALS,
Battelle Memorial Inst., Richland, Wash.
Jack J. C. Hsieh, and Frank P. Hungate.
Soil Sci. 110 (4): 253-257. Illus. 1970.
Identifiers: Compensated, Measuring, Peltier, Plant, Potentials, Psychrometer, Soil, Temperature, Water.

The temperature compensation is achieved by 2 identical thermocouples connected electrically in series, but in opposite polarity. Therefore, most of the current generated by ambient temperature fluctuation will be automatically canceled. With this design, effects of ambient temperature changes are minimized and more accurate measurements of water potential are obtained under field conditions.--Copyright 1971, Biological Abstracts, Inc.
W71-12984

TENSILE STRENGTH OF CLAY FILMS: A MEASURING TECHNIQUE,
Minnesota Univ., St. Paul. Dept of Soil Science.
For primary bibliographic entry see Field 02G.
W71-12996

VENUS: WHERE HAS ALL THE WATER GONE.
Dep. Bot. and Microbiol., Univ. Hawaii, Honolulu, Hawaii, USA. Hawaii Univ., Honolulu. Dept. of Biology and Microbiology.
R. R. Stoecker, and C. E. Folsome.
Space Life Sci. 2 (3): 301-306. Illus. 1970.
Identifiers: Venus, Water.

Conditions on the surface of Venus are reviewed and evidence for the existence of a hydrosphere assessed. Escape mechanisms are examined and found to be insufficient to explain the presumed

absence of liquid water on Venus. The consequences of a hot, acidic hydrosphere are explored as is marginal evidence for biological activity.--Copyright 1971, Biological Abstracts, Inc.
W71-13006

7C. Evaluation, Processing and Publication

FLOOD FREQUENCY ESTIMATING TECHNIQUES FOR SMALL WATERSHEDS,
Hydrocomp International, Palo Alto, Calif.
For primary bibliographic entry see Field 02E.
W71-12261

ENVIRONMENT PATTERN RECONSTRUCTION FROM SAMPLE DATA: 1. MISSISSIPPI DELTA REGION,
Illinois Univ., Chicago. Dept. of Geological Sciences.
Richard B. McCammon.
Illinois University at Chicago Circle, Department of Geological Sciences Technical Report No 1, February 15, 1971. 12 p, 9 fig, 3 tab, 10 ref, append. Contract No N00014-69-A-0090, Task No 389-156, ONR (Geography Programs Branch).

Descriptors: *Mapping, *Statistical methods, *Sedimentation, *Sedimentary structures, *Deltas, Louisiana, Alluvial channels, Beaches, Swamps, Lakes, Flood plains, Meanders, Channel morphology, Bays, Environment, Distribution patterns, Sampling, Statistics, Correlation analysis, Mississippi River, Computer programs, Statistical models.
Identifiers: *Pattern reconstruction (Statistical).

A 10% random sample of map data is adequate to reproduce the first order spatial characteristics of the distribution pattern for the seven major types of depostional environments in the Mississippi Delta region of southeast Louisiana. This conclusion is based on: (1) dendrographs which portray interdistance relationships among mean coordinate locations for the different environments, (2) the sampling properties of the Goodman-Kruskal measure of cross association as it is applied to nearest unlike neighbor samples, and (3) proximal maps which are reconstructions of the original pattern based on sample data. In analyzing map patterns, principal component analysis can be used to depict spatial trends. In the Mississippi Delta region, the natural levee, point bar, bay-sound, and beach environments show a marked linear trend whereas the swamp, lacustrine, and marsh environments are more isotropic. (Knapp-USGS)
W71-12277

RUNOFF EVALUATION AND STREAMFLOW SIMULATION BY COMPUTER,
Corps of Engineers, Portland, Oreg.
For primary bibliographic entry see Field 02E.
W71-12289

STOCHASTIC OPTIMIZATION AND SIMULATION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS (VOLUME I), INTRODUCTION.
Texas Water Development Board, Austin, Texas; and Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 06A.
W71-12325

STOCHASTIC OPTIMIZATION AND SIMULATION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS (VOLUME II), (PROGRAM DESCRIPTIONS).
Texas Water Development Board, Austin, Texas; and Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 06A.
W71-12326

STOCHASTIC OPTIMIZATION AND SIMULATION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS (VOLUME III), DATA MANAGEMENT AND ANALYSIS PROGRAM DESCRIPTION.
Texas Water Development Board, Austin, Texas; and Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 06A.
W71-12327

CHAPTER 5. USE OF COMPUTER TECHNOLOGY TO DEVELOP MATHEMATICAL MODELS FOR NATURAL BODIES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 02A.
W71-12352

WATER RECORDS OF PUERTO RICO, 1964-67, VOLUME 1--NORTH AND NORTH EAST SLOPES,
Geological Survey, San Juan (Puerto Rico).
James B. Rickler.
Available from US Geological Survey, Bldg 652, Ft Buchanan, PR 00934. Geological Survey Data Report, 1970. 269 p, 9 fig, 3 ref.

Descriptors: *Hydrologic data, *Data collections, *Groundwater, *Surface waters, *Puerto Rico, Streamflow, Stream gages, Gaging stations, Water wells, Water levels, Water analysis, Chemical analysis, Water quality, Flow rates, Sediment transport, Particle size.
Identifiers: *Basic data report.

The surface-water, quality-of-water, and groundwater records for the north and northeast slopes of Puerto Rico for calendar years 1964 through 1967 are presented. Included are records for streamflow stations, groundwater wells, and the chemical and physical characteristics of surface and groundwater. The locations of all observation stations, except miscellaneous stations are shown on maps. The records were collected by the Caribbean District of the Water Resources Division, US Geological Survey, in financial cooperation with agencies of the Commonwealth of Puerto Rico. (Woodard-USGS)
W71-12365

GROUNDWATER RESOURCES OF BURKE AND MOUNTRAIL COUNTIES,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 02F.
W71-12368

GROUNDWATER BASIC DATA, NELSON AND WALSH COUNTIES, NORTH DAKOTA,
Geological Survey, Grand Forks, N. Dak.
Joe S. Downey.
North Dakota Geological Survey Bulletin 57, Part II, and North Dakota Water Commission County Groundwater Studies 17, Part II, 1971. 459 p, 2 fig, 2 plate, 6 tab, 26 ref.

Descriptors: *North Dakota, *Water supply, *Water wells, *Groundwater, *Water utilization, On-site data collections, Electrical well logging, Surveys, Hydrologic data, Data collections, Hydrologic properties, Physical properties, Chemical analysis, Regional analysis, Water chemistry, Inorganic compounds, Water quality, Evaluation.
Identifiers: Nelson County (N Dak), Walsh County (N Dak).

Basic groundwater data on Nelson and Walsh Counties, North Dakota were collected between 1967-1970, using 2,150 wells and test holes, water level measurements in 83 observation wells, logs of 600 test holes and wells, chemical analyses of 300 water samples, and particle-size analyses of material from various aquifers. The purpose of this investigation was to present a detailed and informative report on groundwater availability in Nelson and Walsh Counties in respect to future water resources development. (Glasby-USGS)
W71-12370

GROUNDWATER BASIC DATA, BENSON AND PIERCE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
P. G. Randich.
North Dakota Geological Survey Bulletin 59, Part II, and North Dakota Water Commission County Groundwater Studies 18, Part II, 1971. 360 p, 2 fig, 1 plate, 5 tab, 16 ref.

Descriptors: *North Dakota, *Water supply, *Water wells, *Groundwater, *Water utilization, On-site data collections, Electrical well logging, Surveys, Hydrologic data, Data collections, Hydrologic properties, Physical properties, Chemical analysis, Regional analysis, Water chemistry, Inorganic compounds, Water quality, Evaluation.
Identifiers: Benson County (N Dak), Pierce County (N Dak).

Basic groundwater data on Benson and Pierce Counties, North Dakota were collected between 1967-1970 using 1,780 wells and test holes, water level measurements in 181 observation wells, logs of 667 test holes and selected wells, chemical analysis of 303 water samples, and particle-size analyses of 117 samples of water-bearing materials. The purpose of this investigation was to present a detailed and informative report on groundwater availability in Benson and Pierce Counties in respect to future water resources development. (Glasby-USGS)
W71-12371

CENTRAL FRESNO COUNTY WATER AND LIQUID WASTE PROGRAM: VOLUME III. EXISTING WATER AND WASTE FACILITIES.
Grunwald, Crawford and Associates, Inc., Fresno, Calif.
For primary bibliographic entry see Field 05D.
W71-12374

THEORETICAL ANALYSIS OF AQUIFER RESPONSE DUE TO DEWATERING AT WELLAND,
Hydrology Consultants Ltd., Cooksville (Ontario).
For primary bibliographic entry see Field 02F.
W71-12386

COMPUTATION OF RIVER WATER MINERALIZATION DURING FORECASTING BY MEANS OF A 'NAIRI' ELECTRONIC COMPUTER,
Rostov-onDon State Univ., USSR.
V. I. Rogozhkin, A. I. Shestopalova, N. M. Guseva, and N. Ya. Avdeyev.
Translated from Hydrochemical materials (Gidrokhimicheskiye materialy), Vol. 51, 1969, pp. 217-218. Soviet Hydrology: Selected Papers, No 6, p 625-626, 1969. 2 p, 2 ref.

Descriptors: *Computer programs, *Water quality, *Salinity, *Data processing, Streamflow, Equations, Discharge (Water), Low flow, Peak discharge, Data collections, Sampling.
Identifiers: *USSR.

An equation is proposed that permits computing water mineralization from a chemical analysis of a minimum number of water samples for known discharges, using data on mineralization determined for any known water discharge, mineralization for maximum discharge, and mineralization corresponding to minimum discharge. This equation makes it possible to use already existing data and in some cases to reduce the volume of very laborious hydrochemical observation. To broaden the range of application of this equation, it was used as a basis for a computer program. This program has two flowcharts. First the computer selects the most characteristic results of chemical analysis of water samples for a given river from the total

amount of data. Then it determines the parameters of the equation and the desired water mineralization. The results of observations for a large number of rivers (1-300) can be inserted simultaneously into the computer and mineralization for any discharge between the extreme values. (Knapp-USGS)
W71-12403

WATER WELLS IN THE HARPER, SUPERIOR, AND CUDDEBACK VALLEY AREAS, SAN BERNARDINO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
W. R. Moyle, Jr.
State of California, Documents Section, P.O. Box 20191 Sacramento 95820--$2.00. California Department of Water Resources Bulletin No 91-19, May 1971. 99 p, 30 map, 5 tab, 11 ref.

Descriptors: *Data collections, *Water wells, *Springs, *California, Deserts, Geohydrologic units, Valleys, Alluvium, Playas, Groundwater recharge, Geologic mapping, Specific capacity, Aquifer characteristics, Water chemistry, Water levels, Pump testing.
Identifiers: *San Bernardino County (Calif.), Harper Valley, Superior Valley, Cuddeback Valley.

Data collections are presented in tables and on maps for water wells and springs in three valley areas in southern California. One of a series of 19 such bulletins for California, this report gives records for 322 wells and springs. Information items include location of wells and springs; description of well, yield, water use, and water level on dates observed; name of owner; and pumping data, including depths, rates, static water levels, drawdowns, and specific capacities. Lithologic data from driller's logs are tabulated for 37 wells. Chemical analyses for 64 water samples are tabulated. Pumping test data are given for 94 wells. Page-size maps show the generalized geology and location of wells and springs for 30 areas in the Harper, Superior and Cuddeback Valleys. A title list is given for the 18 earlier publications in the data collection series. (Lang-USGS)
W71-12417

A CONTRIBUTION TO THE OBJECTIVE ASSESSMENT OF AREAL RAINFALL AMOUNTS,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 02B.
W71-12427

EVALUATION OF A DIGITAL CATCHMENT MODEL ON NEW ZEALAND CATCHMENTS,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
M. J. Wood, and A. J. Sutherland.
In: Wellington Symposium - The Results of Research on Representative and Experimental Basins; December 1-8, 1970, New Zealand: New Zealand Journal of Hydrology, Vol 9, No 2, p 323-335, 1970. 13 p, 3 fig, 5 tab, 4 ref.

Descriptors: *Mathematical models, *Rainfall-runoff relationships, *Simulation analysis, Parametric hydrology, Routing, Model studies, Water balance, Hydrologic budget, Hydrologic cycle, Computer programs.
Identifiers: *Experimental watersheds, *New Zealand, *Stanford Watershed Model.

A daily version of the Stanford Watershed Model IV has been used on four experimental basins and one larger catchment in New Zealand. Sensitivity tests showed that changing the values of those model parameters describing moisture capacities and the associated recession constants did not affect the resultant simulation significantly. Optimum values of the more significant parameters, the infiltration and interflow parameters, were found to depend upon the calculation time interval as well as the catchment characteristics. A procedure for using the model on ungaged catchments in New Zealand is suggested. (Knapp-USGS)
W71-12431

AN EMPIRICAL RELATIONSHIP BETWEEN RAINFALL AND RUNOFF,
Ministry of Works, Hamilton (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 02A.
W71-12433

A HYDROCHEMICAL MAP OF THE OXIDATION CAPACITY OF RIVER WATERS OF THE EUROPEAN USSR AND CAUCASUS (Gidrokhimicheskaya karta okislyayemosti rechnykh vod Yevropeyskoy chasti SSSR i Kavkaza),
Gidrokhimicheskii Institut, Novocherkassk (USSR).
For primary bibliographic entry see Field 02K.
W71-12438

IDENTIFICATION OF MATHEMATICAL MODELS FOR DO AND BOD CONCENTRATIONS IN POLLUTED STREAMS FROM NOISE CORRUPTED MEASUREMENTS,
Purdue Univ., Lafayette, Ind. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 05B.
W71-12452

EVALUATION OF THE WORTH OF ADDITIONAL DATA,
Arizona Univ., Tucson. Systems Engineering and Hydrology.
D. R. Davis, and W. M. Dvoranchik.
Water Resources Bulletin, Vol 7, No 4, p 700-707, August 1971. 2 fig, 3 tab, 5 ref. OWRR Project B-077-ARIZ (7).

Descriptors: *Decision making, *Systems analysis, *Computer programs, *Data collections, *Economics, Statistical methods, Planning, Economic justification, Probability, Costs, Cost analysis, Evaluation.
Identifiers: Decision theory.

Inherent in every decision process is a certain amount of uncertainty, which is reduced with information. Perfect knowledge yields no certainty for a process, but perfect knowledge for hydrologic and water resource systems would require a highly excessive investment. A procedure is given to calculate a value for this uncertainty so that it may be compared to a cost of further investment, and it would provide a basis for deciding the time at which the value of additional data does not exceed the cost of that data. A decision theory approach is employed on a hydrologic problem to formalize the steps in making a decision. Examples are given. (Knapp-USGS)
W71-12604

INTERNATIONAL LEGEND FOR HYDROGEOLOGICAL MAPS.

United Nations Educational, Scientific and Cultural Organization (UNESCO) Report, 1970. 101 p, 48 ref. (Printed by Cook, Hammond and Kell Ltd., Croydon, England).

Descriptors: *Mapping, *Maps, *Hydrogeology, Geology, Water levels, Topography, Contours, Cross-sections.
Identifiers: *Hydrogeological maps, *Legends (Maps).

A legend is presented to facilitate the preparation of hydrogeological maps, regardless of scale, in an internationally standardized form. The main intent is for use on international maps, but the symbols may be used for national, regional and local purposes. The legend was compiled with the object of presenting an internationally agreed set of symbols. Hydrogeological maps are specialized maps on which groundwater resources and, as far as necessary, surface-water features are depicted on a base of topography and geology. Apart from their importance to hydrologists and groundwater specialists, hydrogeological maps are required also for town and country planning, technicians in agricultural, industrial and domestic water supplies, as well as by farmers, industrialists and private individuals. (Knapp-USGS)
W71-12621

METHODS AND INSTRUMENTS, ALLOWANCE FOR SEA WATER DENSITY IN DEEP-SEA MEASUREMENTS,
Laboratories of Underwater Studies and Hydrooptics, Moscow (USSR).
N. P. Mif.
Oceanology (USSR), Vol 9, No 4, p 557-560, 1970. 4 p, 2 fig, 4 ref.

Descriptors: *Density, *Sea water, *Calibrations, *Instrumentation, *Oceanography, Salinity, Surveys, Statistics, Water temperature, Hydrography.

Average statistical values for the density of sea water may be used with instruments in which corrections for the density of sea water at the measuring site cannot be applied during use. The mean statistical relationship between the density of the sea water and depth is given for the ocean as a whole, and mathematical expressions are provided for determining the maximal deviations of the density of sea water from the mean statistical values. The calibration characteristics and limiting errors of a hydrostatic depth gage are discussed as an example of the way in which the density of sea water can be taken into consideration. (Knapp-USGS)
W71-12644

THE USE OF ELECTRICAL ANALOG MODELS FOR STUDYING DYNAMIC PROCESSES IN THE SEA,
Gidrometeorologicheskii Institut, Leningrad (USSR).
V. A. Makarov, and A. B. Menzin.
Oceanology (USSR), Vol 10, No 5, p 646-650, 1970. 5 p, 5 ref.

Descriptors: *Ocean currents, *Ocean circulation, *Analog models, Model studies, Waves (Water), Currents (Water), Topography, Channel morphology, Oceanography.

Analog models for studying dynamic processes in the sea were developed in the Electrical Simulation Laboratory at the Leningrad Hydrometeorological Institute. Experiments were conducted to study both steady-state and non-steady-state processes in the sea. The problem of the propagation and transformation of a long wave, when the shoreline and bottom profile change, was investigated; a method was developed for determining the periods of the free oscillations of a fluid in actual basins. Wind-induced and deep-water circulation in actual basins were also simulated in the laboratory. The question of the effect of a relatively completer approximation of shoreline features on the quality of the results was examined. An electrical analog was developed for solving circulation problems in multiply connected regions. (Knapp-USGS)
W71-12657

ANNUAL AND SEASONAL RAINFALL IN FLORIDA,
Geological Survey, Tallahassee, Fla.
G. H. Hughes, E. R. Hampton, and D. F. Tucker.
Florida Bureau of Geology Map Series No 40, 1971. 1 p, 3 fig, 3 ref.

Descriptors: *Rainfall, *Rainfall disposition, *Rainfall intensity, *Florida, Seasonal, Annual, Average, Maps, Hydrologic data, Distribution patterns.
Identifiers: Hydrologic atlas (Florida rainfall).

A one-sheet hydrologic atlas contains 8 illustrations describing annual and seasonal rainfall in Florida. The map of mean annual rainfall shows that rainfall varies from about 40 inches in the

Florida Keys to more than 64 inches in southeast and northwest Florida, and is greater than 50 inches over most of the State. The distribution of mean seasonal rainfall in Florida is shown by maps for different seasons of the year. The variation of annual rainfall is even greater than the areal variations of mean seasonal and mean annual rainfall. The annual, summer, and winter rainfall at Pensacola, Gainesville, and Everglades during 1930-65 are shown by the bar graphs. (Woodard-USGS)
W71-12666

WATER RESOURCES DATA FOR COLORADO: PART I. SURFACE WATER RECORDS, 1970.
Geological Survey, Denver, Colo.

Geological Survey Basic Data Report, 1971. 396 p, 2 fig, 3 ref.

Descriptors: *Surface waters, *Streamflow, *Flow measurement, *Hydrologic data, *Colorado, Data collections, Gaging stations, Flow rates, Average flow, Low flows, Peak discharge, Discharge measurement, Stream gages, Lakes, Reservoirs, Water levels.
Identifiers: *Surface water records (Colo).

Surface-water records at 304 sites for the 1970 water year for Colorado, including records of streamflow or reservoir storage at gaging stations, partial-record stations, and miscellaneous sites, are presented. The base data collected at gaging stations consist of records of stage and measurements of discharge of streams or canals, and stage, surface area, and contents of lakes or reservoirs. In addition, observations of factors affecting the stage-discharge relation or the stage-capacity relation, weather records, and other information are used to supplement base data in determining the daily flow or volume of water in storage. Data collected at partial-record stations and at miscellaneous sites are given in three tablets at the end of the surface-water records. The first is a table of discharge measurements at low-flow partial-record stations, the second is a table of annual maximum stage and discharge at crest-stage stations, and the third is a table of discharge measurements at miscellaneous sites. (Woodard-USGS)
W71-12685

THE W.A.T.E.R. SYSTEM: COMPUTER PROGRAMS FOR STREAM NETWORK ANALYSIS,
Purdue University, Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 07A.
W71-12689

URBAN RUNOFF CHARACTERISTICS,
Cincinnati Univ., Ohio. Div. of Water Resources.
For primary bibliographic entry see Field 05G.
W71-12703

MORE ON PLANNING EXPERIMENTS TO INCREASE RESEARCH EFFICIENCY,
Allied Chemical Corp., Buffalo, N.Y. Specialty Chemicals Div.
For primary bibliographic entry see Field 07A.
W71-12710

POWER SUPPLIES FOR COMPUTER-CONTROLLED INSTRUMENTATION SYSTEMS,
Hewlett Packard Co., Newark. New Jersey Div.
Brett M. Nordgren.
Electronic Instrument Digest, Vol 6, No 12, p 7-11, December 1970. 2 fig.

Descriptors: *Computer programs, *Digital computers, *Electronic equipment, Instrumentation, Data processing, Data storage and retrieval.
Identifiers: *Digitally controlled power supplies, Multiplexing.

A number of sophisticated digitally controlled power supplies that can be programmed directly from a digital computer are available commercially. The characteristics of typical designs are described, performance tradeoffs are discussed, and selection criteria--including the decision to make or buy--are presented. System considerations are also illuminated with an example of a hypothetical test system. (Mortland-Battelle)
W71-12711

FLOODS IN ARKANSAS, MAGNITUDE AND FREQUENCY CHARACTERISTICS THROUGH 1968,
Geological Survey, Little Rock, Ark.
J. L. Patterson.
Arkansas Geological Commission, Water Resources Circular No. 11, 1971. 246 p, 19 fig, 5 tab, 13 ref, 2 append.

Descriptors: *Floods, *Evaluation, *Analytical techniques, *Application methods, *Arkansas, Water measurement, Gaging stations, Estimating equations, Data collections, Topography, Terrain analysis, Peak discharge, Watersheds (Basins).
Identifiers: *Flood frequency, Flood magnitude, Surface water records.

Techniques are presented for estimating the magnitude and frequency of floods on Arkansas streams. Modern topographic maps now available and computer techniques facilitate in making a comprehensive analysis in which physical and climatic characteristics of river basins are related to flood characteristics at gaging stations. Equations derived from the analysis permit making estimates of the magnitude of future floods with recurrence intervals of as much as 50 yr on gaged and ungaged streams that have drainage areas of 0.1 to 3,000 sq mi. An estimate of the future flood potential can be used to locate and design flood-control structures, establish flood-insurance rates, and devise flood-zoning plans. Appendixes in the report contain data on flood characteristics of gaged drainage basins, a summary of climatic and topographic characteristics of drainage basins, peak stages and discharges for gaging stations that have 5 or more years of record, and peak-flow data for outstanding floods at miscellaneous sites. Of the 259 gaging stations for which data are given, 154 are recording and 105 are crest-stage gages for which only 8 to 10 yr of record are available. (Lang-USGS)
W71-12789

WATER WELLS IN THE SAN LUIS REY RIVER VALLEY AREA, SAN DIEGO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
W. R. Moyle, Jr.
California Dept of Water Resources Bulletin No 91-18, May 1971. 347 p, 28 map, 5 tab, 13 ref.

Descriptors: *Data collections, *Water wells, *Valleys, *California, Hydrologic data, Pump testing, Specific capacity, Water levels, Water chemistry, Logging (Recording), Geohydrologic units, Alluvium, Aquifer characteristics, Groundwater recharge.
Identifiers: *San Diego County (Calif), San Luis Rey Valley, Driller logs.

Data collections are presented in tables and on maps for water wells in San Luis Rey Valley, southwestern California. Descriptions are given for 2,260 wells in this report, one of a series of 19 such reports. Information items include location of wells; description of wells, well yield, water use, and water level on dates observed; name of owner; hydraulic data from pumping; and chemical analyses of water samples. Information on water use and water levels on dates observed are given for several hundred wells; lithologic descriptions from driller's logs are shown for 296 wells; 1,090 chemical analyses are tabulated; and data for 679 pumping tests are presented. Pumping test data include static and pumping water levels, well yields, and specific capacities (gpm/ft of dd). Page-size maps show the generalized geology and well locations for 28 areas. Map base is from USGS 7 1/2-minute topographic quadrangles, scale 1:24,000. (Lang-USGS)
W71-12790

COMPUTER ANALYSIS OF FLOW TOWARD ARTESIAN WELLS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W71-12841

APPLICATION OF COMPUTERS TO THE CALCULATION OF THE MORPHOMETRIC CHARACTERISTICS OF A CHANNEL IN A POINT BAR TYPE OF CHANNEL PROCESS (O vychislenii na EVM morfometricheskikh kharakteristik rusla pri pobochnevom tipe ruslovogo protsessa),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W71-12851

08. ENGINEERING WORKS

8A. Structures

DESIGNING RESERVOIRS WITH SHORT STREAMFLOW RECORDS,
Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
G. Tschannerl.
Water Resources Research, Vol 7, No 4, p 827-833, August 1971. 5 fig, 2 tab, 9 ref.

Descriptors: *Hydrologic data, *Reservoir design, *Statistical methods, *Simulation analysis, Stochastic processes, Synthetic hydrology, Optimization, Systems analysis, Mathematical models, Cost-benefit analysis, Streamflow, Water yield.
Identifiers: Streamflow records.

A hydraulic structure such as a reservoir built on the basis of sample information is, in general, overdesigned or underdesigned in relation to perfect information. The resulting loss in net benefits is called the expected opportunity loss (EOL) due to imperfect information and is a function of sample size. Computation of the EOL requires perfect information. The EOL can, however, be found in one of two ways. One procedure estimates the EOL by sampling from a synthetic sequence of a stochastic input, such as streamflow, generated on the basis of estimates of the population moments. The other procedure involves a design decision within the framework of subjectivist (or Bayesian) statistics. (Knapp-USGS)
W71-12451

MODELS OF MINERALIZED SOLUTION-COLLAPSE STRUCTURES FROM DRILLING STATISTICS: AN AID TO EXPLORATION,
Geological Survey, Knoxville, Tenn.
H. Wedow, Jr.
Economic Geology, Vol 66, No 5, p 770-776, August 1971. 5 fig, 3 tab, 9 ref.

Descriptors: *Hydrogeology, *Karst, *Water chemistry, *Structural geology, Groundwater movement, Surveys, Geochemistry, Mining, Exploration, Stratigraphy, Dolomite, Limestones, Regression analysis.
Identifiers: *Solution-collapse structures.

Variations in thickness and metal content of selected stratigraphic units cut by drill holes in the East Tennessee zinc districts were analyzed by regression techniques. As the thickness of an underlying limestone unit is decreased chiefly by solution thinning, overlying fine-grained dolomite units increase in thickness by collapse dilation. Variation in metal content is closely associated with this inverse thickness relationship because of the deposition of the ore minerals in the dilation openings.

Most of the ore is found where the fine-grained dolomite units are so dilated by collapse as to form breccias. Hypothetical cross sections synthesized from widely spaced drill-hole data show mineralized structures of size, shape, and distribution of metal comparable to those seen in actual field relations. (Knapp-USGS)
W71-12696

FATIGUE STRENGTH OF HOT ROLLED DEFORMED REINFORCING BARS,
University of Alberta, Edmonton, Canada; Stanley and Associates Engineering, Ltd, Edmonton, Canada.
J. G. MacGregor, I. C. Jhamb, and N. Nuttall.
J Amer Concr Inst, Proc, Vol 68, No 3, p 169-179, Mar 1971. 11 p, 8 fig, 6 tab, 15 ref.

Descriptors: Beams (Structural), Cyclic loads, Deformed bars, *Fatigue (Materials), High strength steels, Reinforced concrete, Ultimate tensile strength, *Reinforcing steels, Foreign research, Tensile strength, *Test results, Stress-strain curves, Laboratory tests, Bibliographies, Failure (Mechanics), Microstructure, *Test procedures, Yield strength.
Identifiers: Canada.

Procedures and results of fatigue tests on Nos. 5, 8, and 10 hot-rolled, deformed reinforcing bars with nominal yield strength of 40, 60, and 75 kips/sq in. are reviewed. Tests were made on reinforced concrete beams containing one such bar and on specimens machined from the bars. The test program consisted of flexural fatigue tests of 72 reinforced concrete beams and 36 standard rotating beam fatigue tests. Although the fatigue strength of machined specimens varied directly as the ultimate tensile strength of the bars, the fatigue strengths of the bars were essentially constant and equal to 30 kips/sq in. for a zero to maximum tension cycle. The difference may possibly be explained by the stress concentrations at the base of the deformation and the presence of a relatively low strength decarburized layer on the outside of all the deformed bars in the test series. (USBR)
W71-12887

CONSTRUCTION INNOVATIONS IN RECLAMATION WORK,
Bureau of Reclamation, Denver, Colo.
B. P. Bellport.
Proc Amer Soc Civ Eng, J Constr Div, Vol 97, No CO1, p 79-93, Mar 1971. 15 p, 8 fig.

Descriptors: Aerial photography, Borehole cameras, *Construction, Soil cement, *Construction equipment, *Innovation, Excavation, Lasers, Dams, *Tunneling, *Photogrammetry, Pumping plants, Foundation investigations, Shafts (Excavations), *Tunneling machines, Water resources development, Blasting.

New techniques being used in constructing Bureau of Reclamation structures and facilities in the 17 Western States are described. In meeting future challenges, the engineering profession and construction industry must devise new construction techniques to accomplish work economically and expeditiously, and use their technologies and experience to provide an improved environment reflecting the relationship of man to his needs and the high standard of living enjoyed in this country. The resourcefulness and skills of engineers and contractors will be challenged as water resources projects grow in magnitude and complexity and as the Nation's needs for water continue to mount. New techniques being used on current construction and other advances promised by on-going and proposed research are indicative of the continuing success of the profession and industry in meeting national goals of water resources development and in attaining the Nation's aspirations in enhancing the quality of our environment. (USBR)
W71-12892

8B. Hydraulics

EXPERIMENTS ON PLANE COUETTE FLOW,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
H. J. Leutheusser, and V. H. Chue.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, Paper 8367, p 1269-1284, September 1971. 9 fig, 8 ref, append. Nat Research Council, Canada, Grant No. A-1541.

Descriptors: *Open channel flow, *Air-water interfaces, *Turbulent flow, *Boundary processes, Hydraulics, Shear drag, Flow resistance.
Identifiers: *Couette flow.

A simple method for generating plane Couette flow is described. In this technique the water surface of a covered open-channel flume represents the moving boundary, and measurements are performed in the overlying (sandwiched) air layer. Experimental results suggest transition from laminar to turbulent plane Couette flow at a Reynolds number (based on center-line velocity and channel half-depth) of about 280. Turbulent mean velocities are correlated in terms of inner and outer law coordinates, and universal skin friction laws are derived for the case of hydrodynamically smooth boundaries. However, it is concluded that none of the experimental data on turbulent plane Couette flow support for von Karman's theory of homologous turbulence. A cursory exploration of the effects of unilateral boundary roughness suggests that mean-flow characteristics on the smooth side of a Couette channel assume the features prevailing on the rough side. (Knapp-USGS)
W71-12253

SELF-AERATED FLOW CHARACTERISTICS IN WALL REGION,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
N. S. Lakshmana Rao, and T. Gangadharaiah.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, Paper 8359, p 1285-1303, September 1971. 15 fig, 17 ref, append.

Descriptors: *Air entrainment, *Aeration, *Open channel flow, *Turbulent flow, Turbulence, Roughness (Hydraulic), Bubbles, Mixing, Boundary processes.
Identifiers: Self-aerated flow.

Characteristics of self-aerated flows in the wall region, including the distribution of velocity and air concentration in the wall turbulent zone were studied by dividing the wall turbulent zone into an inner and outer region according to the eddy viscosity distribution. The inner region ceases to exist under certain conditions of air concentration on the wall. The values of the Karman constant and Manning's roughness coefficient show increases in value as air concentration increases. Estimation of the average velocity and the probable diameter of an air bubble shows a definite relation with mean air concentration in the wall region. (Knapp-USGS)
W71-12254

TRACER STUDIES OF SEDIMENT TRANSPORT PROCESSES,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 02J.
W71-12255

FLUID-DYNAMIC CONSIDERATION OF BOTTOM MATERIALS,
Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
For primary bibliographic entry see Field 02J.
W71-12256

NONUNIFORM FLOW IN FLAT RECTANGULAR CHANNELS,
Camp, Dresser and McKee, Boston, Mass.
K. M. Yao.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, Paper 8369, p 1343-1348, September 1971. 1 fig, 4 ref, append.

Descriptors: *Stage-discharge relations, *Open channel flow, *Unsteady flow, *Backwater, *Flow profiles, Gradually varied flow, Analytical techniques, Non-uniform flow.
Identifiers: *Nomographs.

Nonuniform flow is possible in flat open channels and the surface profile of flow in such a channel is always in the form of a backwater curve. The present practice for backwater profile computations either needs expensive computer time or it employs a very tedious manual trial and error method. An easy-to-use alignment chart is developed for determining surface profile of subcritical, gradually varied flow in flat rectangular open channels. The only parameter needed in applying the chart is the critical depth which can also be read from an auxiliary scale in the chart. Knowledge of nonuniform flow is not essential for using the chart. Numerical examples are included. (Knapp-USGS)
W71-12258

DE SAINT-VENANT EQUATIONS EXPERIMENTALLY VERIFIED,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Hydrology.
W. Brutsaert.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY-9, Paper 8378, p 1387-1401, September 1971. 10 fig, 26 ref, append.

Descriptors: *Unsteady flow, *Numerical analysis, *Hydrograph analysis, Overland flow, Rainfall-runoff relationships, Streamflow forecasting, Runoff forecasting.
Identifiers: *Saint-Venant equations.

The unsteady spatially varied flow equations (De Saint-Venant equations) may be solved by implicit finite differences with explicit description at the boundaries. Imposition of improper boundary conditions which violate the physics of the problem result in violation of continuity or in numerical instability problems or meaningless results. The magnitude of the spatial increment used in the inplicit solution scheme was critical on steep slopes (2.0%). The temporal distribution of flow and time to equilibrium was altered considerably depending on the specified increment of distances. Hydrographs on milder slopes (0.5% and 1.0%) were affected to a progressively lesser extent as the channel slope was decreased. The time to equilibrium flow starting from a dry bed was nonlinear with respect to change of channel length, channel slope, and rate of lateral inflow. For a given channel length and slope, time to equilibrium approached a constant for high rates of lateral inflow. (Knapp-USGS)
W71-12260

FLOW IN CHANNELS,
Queen's Univ., Belfast (Northern Ireland). Dept. of Civil Engineering.
Robert H. J. Sellin.
New York, N Y, Gordon and Breach Science Publishers Inc, 1970. 149 p.

Descriptors: *Open channel flow, *Streamflow, *Alluvial channels, Hydraulics, Hydrology, Steady flow, Unsteady flow, Gradually varied flow, Uniform flow, Turbulent flow, Erosion, Scour, Sediment transport, Stage-discharge relations, Velocity, Flow control, Regulation, Gaging stations, Bed load, Suspended load, Flood plains, Sedimentation, Flood routing, Routing.

This book is intended mainly for students of hydraulic engineering who have already gained a

basic knowledge of fluid mechanics and who wish to study the hydraulics of open channels. Inclusion of selected references should make the book of value to postgraduate students and engineers, requiring an introduction to the subject. An introduction to alluvial channel flow as well as one to unsteady channel flow is given with more complete treatment of uniform and non-uniform flow in fixed boundary channels. The subjects discussed in detail include uniform flow, gradually varied flow, rapidly varied flow, control and measurement of open channel flow, flow in erodible material, and unsteady flow in open channels. (Knapp-USGS)
W71-12275

CHARACTERISTICS OF TRANSVERSE MIXING IN OPEN-CHANNEL FLOWS,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.
For primary bibliographic entry see Field 05B.
W71-12357

AIDS IN DESIGNING LABORATORY FLUMES,
Geological Survey, Washington, D.C. Water Resources Div.
Garnett P. Williams.
Geological Survey Open-file Report, 1971. 294 p, 69 fig, 2 tab, 42 ref.

Descriptors: *Model studies, *Flumes, *Hydraulic models, *Open channel flow, *Sediment transport, Design, Design criteria, Design data, Instrumentation, Equipment, Construction, Specifications.
Identifiers: *Laboratory flumes.

This manual describes various techniques of design and construction of flumes used to study open channel flow and sediment transport. Advantages and disadvantages of each are pointed out. The basic ingredients of a system are the test channel (flume), water or whatever fluid is to be used, a pump, piping, various tanks, and possibly sediment (for sediment-transport studies). The type of flume chosen depends on space, cost, purpose of flume and help available for performing experiments. Recirculating flumes take up less space and cost less. They are also easier to operate; frequently one man can do everything alone. Consequently for purposes of demonstration of instruction a closed circuit recirculating flume is best. Nonrecirculating flumes offer more accuracy and flexibility in sediment-transport research. Among the two types of recirculating flumes, the closed-circuit type is best for research projects which require detailed flow measurements and for demonstration, whereas the free-overfall type is preferable for sediment-transport research because of the better sediment-sampling opportunities. (Knapp-USGS)
W71-12366

HYDROGEOLOGIC ASPECTS OF DEWATERING AT WELLAND,
University of Western Ontario, London. Dept. of Geology.
For primary bibliographic entry see Field 02F.
W71-12387

THEORETICAL AND EXPERIMENTAL STUDY OF THE SUPERCRITICAL FLOW OF CIRCULAR DRAINS AND THE FORMATION OF THE HYDRAULIC JUMP IN THE SAME,
Puerto Rico Univ., Mayaguez. School of Engineering.
L. A. Nunez.
Puerto Rico Water Resources Research Institute, Mayaguez, Technical Completion Report, Volumes 1-3, June 1971. 256 p, 61 fig, 9 tab, 3 append. OWRR A-014-PR (1).

Descriptors: *Hydraulic jump, *Supercritical flow, *Drains, *Conduits, *Mathematical studies, Reviews, Model studies, Hydraulics, Equations, Theoretical analysis, Analytical techniques, Air entrainment, Flowmeters, Weirs, Critical flow, Subcritical flow.
Identifiers: *Hydraulic jump (Circular drains).

Hydraulic jumps caused by hydraulic transitions from supercritical to subcritical flow in closed conduits were studied to determine optimum diameters of circular drains. In supercritical flow, great amounts of air are entrained. The resulting increase in volume causes an increment of as much as 25 percent in the flow section. The cross section of the conduit must be incremented to accommodate the entrained air. The study is presented in 3 volumes. Extensive reviews of hydraulics of circular drains are included in volumes 1 and 2. In volume 3, the apparatus (tilting transparent sections of circular drains) is described, and a summary of the study is presented. (Woodard-USGS)
W71-12419

METHOD OF CALCULATING SECONDARY FLOW,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W71-12449

DESIGNING RESERVOIRS WITH SHORT STREAMFLOW RECORDS,
Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
For primary bibliographic entry see Field 08A.
W71-12451

OPTIMAL ANGLES OF STREAM JUNCTION: GEOMETRIC, STABILITY TO CAPTURE, AND MINIMUM POWER CRITERIA,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 02J.
W71-12453

RIVER EROSION DUE TO CHANNEL RELOCATION,
Federal Highway Administration, Concord, N.H.
L. W. Yearke.
Civil Engineering, Vol 41, No 8, p 39-40, August 1971. 3 fig, 2 photo.

Descriptors: *Stream erosion, *Channels, *Diversion structures, *Hydraulics, *Sediment transport, Rivers, New Hampshire, Channel flow, Relocation, Sedimentation, Hydrologic data, Sedimentation rates.
Identifiers: *Channel relocation.

If alluvial channels must be relocated, the pre-existing hydraulic gradient should be preserved. Because flooding along the Peabody River in New Hampshire undermined a section of roadway, the River channel was relocated (manmade) in that section. The Peabody River was shortened by approximately 850 ft and its alignment straightened by this channel change. A small side stream was diverted into the original abandoned channel and made to flow in the opposite direction. Immediately after construction, the channel began to rapidly seek its hydraulic gradient through erosion and scour. Its adjustment was a continuing process with the major change occurring within the first year and adjustments of decreasing significance occurring each year thereafter. The original channel had an average fall of 52 ft/mi and the relocated channel was steepened to 80 ft/mi. The channel adjusted itself to 75 ft/mi after two years and to 70 ft/mi seven years after construction. A channel cannot tolerate a severe gradient increase; thus, the upstream end of the channel degrades and the downstream end fills to overcome the man-made restructuring. (Woodard-USGS)
W71-12469

RESISTANCE TO FLOW IN FLAT-BED SAND CHANNELS,
Geological Survey, Albuquerque, N Mex.
C. H. Scott, and J. K. Culbertson.
All papers for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $3.50. In: Geological Survey Research 1971, Chapter B, Professional Paper 750-B, p B254-B258, 1971. 4 fig, 6 ref.

Descriptors: *Alluvial channels, *Channel morphology, *Flow resistance, *Regime, Mannings equation, Chezy equation, Roughness (Hydraulic), Sediment transport.
Identifiers: Flat-bed channels.

The flat bed characteristic of upper regime flow commonly occurs at high discharge in sand channels. Data from many channels with sand beds show that for a flat bed or for a dune bed the velocity varies with hydraulic radius to the one-half power, indicating a constant value of flow resistance. Values of flow resistanpper regime flow for 24 channels were used in a regression analysis to determine the effects of median particle diameter of bed material and of slope. Flow resistance could be expressed as a function of median particle diameter alone. The relationship of Manning's n to median diameter of bed material and hydraulic radius is given in graphical form. (Knapp-USGS)
W71-12681

AN ENGINEERING STUDY OF AIR AND WATER INTERFACIAL INTERACTION,
Connecticut Univ., Storrs. Inst. of Water Resources.
J. D. Lin.
Available from the National Technical Information Service as PB-202 875, $3.00 in paper copy, $0.95 in microfiche. Completion Report, June, 1971. 4 p. OWRR A-021-CONN (1).

Descriptors: *Air-water interfaces, Winds, *Waves (Water), Boundary layers, Energy gradient, Channels.
Identifiers: Dominant waves, Energy density spectra.

An experimental study of wind-generated waves was carried out in a wind-wave channel under the laboratory conditions with and without pressure gradients. A series of experiments was first conducted by the boundary layer measurement over a smooth solid surface as a survey of the flow characteristics of the channel as well as a basis of reference for the wind waves. A steady, two-dimensional wind with a maximum speed of 38 feet per second was established. The fully-developed equilibrium water wave was obtained at a depth of 7-5/8 inches and at a fetch distance of 30 feet. The following pertinent quantities were derived from the wind-wave experiment: the profiles of mean velocity and turbulent intensity of wind, the deviation of mean surface from the undisturbed surface of water, the standard deviation of water surface, the energy density spectrum of wind waves and the dominant wave. The results confirm the existance of a dominant wave in a narrow frequency band and its asymmetric character and the 1/5 power law for the energy density spectra in the equilibrium range of wind waves. It is also possible to make a direct comparison of the boundary layer over a smooth solid surface and over waves, and of the wind-generated waves with and without pressure gradients.
W71-12700

COMPARISON OF EMPIRICAL RELATIONSHIPS BETWEEN PRESSURE HEAD AND HYDRAULIC CONDUCTIVITY AND SOME OBSERVATIONS ON RADIALLY SYMMETRIC FLOW,
Agricultural Research Service, Madison, Wis.
For primary bibliographic entry see Field 02G.
W71-12831

UNSTEADY SPREAD OF BUOYANT SURFACE DISCHARGE,
Memorial Univ. of Newfoundland, St. John's. Dept. of Engineering.
For primary bibliographic entry see Field 05B.
W71-12839

HYDROMORPHOLOGICAL INVESTIGATIONS OF FLOOD PLAIN AND CHANNEL

PROCESSES (Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protsessov).
State Hydrological Inst., Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 183, Popov, I.V., ed., 1970. 212 p.

Descriptors: *Hydraulics, *Channel morphology, *Channel flow, *Flood plains, *Hydraulic models, Model studies, Simulation analysis, Aerial photography, Computers, Meanders, Braiding, Sediment discharge, Sediment transport, Channel erosion, Scour, Overland flow, Unsteady flow, Cross sections, Slopes, Banks.
Identifiers: *USSR, *Channel pattern, *Hydraulic geometry, Morphometry, Hydraulic modeling, Anabranches, Channel deformations, Flow velocities, Nonscouring velocity, Riffles.

This collection of 13 papers is devoted to studies of the morphology and hydraulics of natural channels and of the hydraulic phenomena occurring on inundated flood plains. The results of the application of electronic computers to the solution of problems of channel morphology and hydraulics are reported for the first time. The subjects discussed in this collection include: (1) the use of aerial photography for evaluating the flooding and discharge processes on river flood plains; (2) the hydraulics of flood-plain channels in limited meandering; (3) the channel dynamics of mountain rivers; (4) the relationship between the horizontal deformation rate of a river channel and the river discharge and morphological reforming cycles; (5) the morphology and hydraulics of meanders in free meandering; (6) the application of computers to the calculation of morphometric characteristics of a channel in a point-bar type of channel process; and (8) the hydraulic modeling of flows in bodies of water. The discrete approach, adopted by the Department of Channel Processes of the State Hydrologic Institute for studying the morphology and hydraulics of natural channels and flood plains and for constructing hydromorphological relationships, was based on an extensive use of field data. (See also W71-12844 thru W71-12854) (Josefson-USGS)
W71-12843

ON-SITE INVESTIGATIONS OF THE HYDRAULICS OF A FLOOD PLAIN DURING A PERIOD OF VERY HIGH WATER (Naturnyye issledovaniya gidravliki poymennogo massiva v vysokoye polovod'ye),
State Hydrological Inst., Leningrad (USSR).
Z. M. Velikanova, and N. A. Yarnykh.
In: Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protsessov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 183, p 33-53, 1970. 5 fig, 6 tab, 3 ref.

Descriptors: *Hydraulics, *Flood plains, *Overland flow, *Discharge (Water), *Channel flow, Channel morphology, Channel erosion, Floods, River flow, Overflow, Deposition (Sediments), Flow rates, Water storage, Water level fluctuations, Peak discharge, Hydrographs, Unsteady flow, On-site investigations.
Identifiers: *USSR, Altay Kray, Barnaul, Ob River, Flow velocities.

Investigations were conducted by the State Hydrologic Institute in May-June 1969 in a reach of the Ob River near Barnaul (Altay Kray) for studying the hydraulic processes on a flood plain. The method suggested made it possible to evaluate the discharge of water flowing into and out of the flood-plain reach and to compare these values with the change in the volume of water which filled the reach during various stages of flooding. Three phases of flood-plain flooding were distinguished during a period of exceptionally high water: (1) the start of flooding when the water flowed across depressed sections of the upstream part of the flood plain; (2) the flow of water in a wide front across the upstream part of the flood plain; and (3) the flow of water in disconnected channels during the receding stage. Maximum flow velocities were observed at the edge of the main channel bank at the upper part of the flood plain. Minimum flow velocities were observed on the terraces. The direction of velocities varied between 10 and 30 deg. The velocities increased in the rising stage and decreased in the falling stage. All of the flood discharge went first into storage on the flood plain. The discharge across the flood plain at the peak of the flood was approximately one-third the total discharge. Sediment deposition was observed over the entire flood plain. A maximum sediment thickness of 1.5 m was recorded along the convex shore of the Bystroy anabranch. A minimum thickness of 0.1 and 0.5 cm was noted in the lower and central parts of the flood plain, respectively. (See also W71-12843) (Josefson-USGS)
W71-12845

AN EXPERIMENTAL STUDY OF THE HYDRAULICS OF FLOOD-PLAIN CHANNELS IN LIMITED MEANDERING (Eksperimental'noye issledovaniye gidravliki poymennykh rusel pri ogranichennom meandrirovanii),
State Hydrological Inst., Leningrad (USSR).
N. S. Znamenskaya, and M. M. Filaretova.
In: Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protsessov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 183, p 54-69, 1970. 5 fig, 1 tab, 14 ref.

Descriptors: *Hydraulics, *Channel flow, *Channel morphology, *Flood plains, *Model studies, Channel erosion, Meanders, Unsteady flow, Banks, Flow rates, Velocity, Topography, Cross-sections, Flooding, Slopes, Bottom sediments, Sediment discharge, Beaches, Vegetation.
Identifiers: *USSR, Oka River, Polomet' River, Flow velocities, Riffles.

Field studies on flood plains of the Oka and Polomet' Rivers were used for studying the interaction of channel and flood-plain sections of flow in a laboratory model of limited meandering. The model wzs 12 m long, with a slope of 0.005 and a flood-plain width of 2.2 m. Inundation of the flood-plain sections of limited meandering began at the lower part of the flood plain. Eddy and dead-water zones were observed during partial inundation, with only small individual sections of the flood plains involved in the total transient flow of the channel. When the flood-plain relief was smooth the flow velocities on the flood plain and in the channel were the same; a considerable increase in the flood-plain roughness did not affect the distribution of flows or the ratio of the velocities in the channel and on the flood plain. The presence of natural levees reduced the average flood-plain velocities to 20-40% of those in the channel. The depth of the flood-plain inundation influenced considerably the character of the transient flow. Free water surface slopes had no effect on the distribution of the flood plain and channel flows. The points at which the bottom sediments flowed onto the flood plains were associated with beaches or riffles and were related to the presence of local transverse flows or lateral slopes and to the presence of maximum flow velocities in the bottom part of the channel. The location of pools and riffles depended to a certain extent upon the hydraulic characteristics and discharge of the bottom sediments. (See also W71-12843) (Josefson-USGS)
W71-12846

RELATIONSHIP OF THE TYPES OF CHANNEL PROCESS TO THEIR DETERMINANT FACTORS (Svyaz' tipov ruslovogo protsessa s opredelyayushchimi faktorami),
State Hydrological Inst., Leningrad (USSR).
V. I. Antropovskiy.
In: Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protsessov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 183, p 70-80, 1970. 6 fig, 2 tab, 7 ref.

Descriptors: *Channel flow, *Channel morphology, *Hydraulics, Discharge (Water), Sediment transport, Sediment discharge, Meanders, Braiding, Cross-sections, Velocity, Slopes, Gaging stations, Froude number.
Identifiers: *USSR, Channel deformations, Channel pattern, Bed configuration.

Data from 30 gaging stations located in morphologically uniform river reaches with varying types of channel process were examined for establishing relationships between channel and flow parameters. A study was made of the change in the mean velocity, size, and shape of a transverse cross section of a channel as a function of the slope and type of channel process and as a function of the mean of the maximum annual discharges and type of channel process. The following rlations were established: (1) the product of the width-to-depth relation and mean velocity to the slope and type of channel process; (2) the Froude number to the slope and type of channel process; and (3) the Froude number to the mean of the annual maximum discharges and type of channel process. The relations examined represent, in a differentiated form, the relation of Leopold and Wolman and that of V. V. Romashin. (See also W71-12843) (Josefson-USGS)
W71-12847

CHANNEL DYNAMICS OF MOUNTAIN RIVERS (Problemy ruslovoy dinamiki gornykh rek),
State Hydrological Inst., Leningrad (USSR).
Z. D. Kopaliani, and V. V. Romashin.
In: Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protsessov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 183, p 81-98, 1970. 4 fig, 1 tab, 34 ref.

Descriptors: *Channel morphology, *Alluvial channels, *Sedimentation, *Meanders, Sediment transport, Deposition (Sediments), Bank stabilization, Bank erosion, Channels, Stream erosion, Thalweg, Slopes, Rivers, Mountains, Topography, Valleys, Dunes, Vegetation, Mudflows, Flood plains.
Identifiers: *USSR, *Channel pattern, Georgian SSR, Morphometry, Mountain rivers, Anabranches.

The channel process on mudflow-free mountain rivers was examined in connection with developing a structural approach to channel morphometry. To establish local structural hydromorphometric relationships, studies were conducted in 114 morphologically uniform reaches of 48 mudflow-free and 16 mudflow-laden rivers of the western Georgian SSR. The channel process may be described quantitatively by volumes of sediment redeposition, with the movement of sediment particles expressed in three different modes: (1) rolling; (2) saltation; and (3) suspension. As a result of an increase in slopes, a meandering channel expressed in limited, incomplete or free meandering may gradually become a wandering channel. Three types of meandering are described: (1) channel; (2) flood plain; and (3) valley. Channel meandering is developed during the stabilization of sandbanks or ribbon dunes and may be considered as a genetic analog of limited meandering. Channel meandering is typical of comparatively large rivers and may be defined as the wandering of thalweg among permanently preserved meso- and macroforms of relief during their temporary stabilization. Flood-plain meandering is the formation of new channels by erosion of anabranches on the flood plain. Flood-plain meandering is typical of average-size mountain rivers and is genetically associated with incomplete meandering. Valley meandering is the complete reworking of the flood-plain relief in the erosion phase of flow. This type of wandering is typical of small mountain rivers and is associated with the free meandering of lowland rivers. (See also W71-12843) (Josefson-USGS)
W71-12848

RELATIONSHIP OF THE HORIZONTAL DEFORMATION RATE OF A RIVER CHANNEL TO THE RIVER DISCHARGE AND MORPHOLOGICAL REFORMING CYCLES (K voprosu o svyazi skorosti planovykh deformatsiy

rechnogo rusla s vodnost'yu reki i tsiklami morfologicheskikh pereformirovaniy),
State Hydrological Inst., Leningrad (USSR).
E. A. Konditerova, and I. V. Popov.
In: Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protsessov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 183, p 99-118, 1970. 6 fig, 3 tab, 3 ref.

Descriptors: *Channel flow, *Channel morphology, *Meanders, *Discharge (Water), *Regulation, Channel erosion, Deposition (Sediments), Sediment discharge, Slopes, Flow rates, Hydraulic gradient.
Identifiers: *USSR, *Channel pattern, Altay Kray, Barnaul, Ob River, Meandering, Anabranches.

An estimate of the horizontal deformation of a river channel is of paramount importance in designing hydraulic structures on rivers. To ensure the reliable operation of a water intake near the village of Yeresnaya, a study was made of the channel changes of the Ob River in a reach of well-developed meanders above the city of Barnaul (Altay Kray). The interaction of 7 neighboring channel meanders was examined in describing the horizontal deformation rates of the river channel. Changes of the river channel in incomplete meandering led to a change in the water and sediment discharges and to a change in the rate of the channel process. Straightening of anabranch geometry in the developed meander system led to changes in the discharge of water and sediment. Redistribution of the water discharges, free water surface slopes, and sediment deposition and discharge during incomplete meandering influenced the 7 neighboring meanders and affected the deformation rate of a series of channel meanders. The type of channel process and the stages of channel development must be considered in establishing relationships between the morphological characteristics of the channel and the river discharge. In free meandering the extent to which the meanders are developed must be taken into account; in incomplete meandering both the stage of meander development and the characteristics of meander straightenings must be considered. (See also W71-12843) (Josefson-USGS)
W71-12849

ON-SITE INVESTIGATIONS OF THE MORPHOLOGY AND HYDRAULICS OF MEANDERS IN FREE MEANDERING (Naturnyye issledovaniya morfologii i gidravliki izluchin svobodnogo meandrirovaniya),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W71-12850

APPLICATION OF COMPUTERS TO THE CALCULATION OF THE MORPHOMETRIC CHARACTERISTICS OF A CHANNEL IN A POINT BAR TYPE OF CHANNEL PROCESS (O vychislenii na EVM morfometricheskikh kharakteristik rusla pri pobochnevom tipe ruslovogo protsessa),
State Hydrological Inst., Leningrad (USSR).
V. S. Kozhevnikov.
In: Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protsessov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 183, p 143-154, 1970. 1 fig, 3 tab, 7 ref.

Descriptors: *Channel morphology, *Channel flow, *Channels, *Banks, Meanders, Discharge (Water), Water levels, Water level fluctuations, Low-water mark, Cross-sections, Computers, Computer programs.
Identifiers: *USSR, *Morphometry, Vychegda River, Channel pattern, Riffles.

The possibility of determining the morphometric characteristics of a channel in a point bar type of channel process was based on a study of the Vazhkurskiye riffles located at the upper course of the Vychegda River. The small curvature of the channel and the stability of the banks in this reach for the period under consideration made it possible to trace the patterns of a point bar type of pool-and-riffle channel process developed with limited meandering. The indices used for describing a point bar type of channel process included: (1) the spacing of the point bars, which is the distance along the axial line of the channel between two neighboring inflection points on the line in the low-water period, expressed in m; (2) the width of the channel, which is defined as the distance between the boundaries of the channel (between the edges of the opposite banks) in m; (3) the width of the channel in low water, which is the distance between the low-water edges, in m; (4) the height of the point bar, which is defined as the excess crest of the bar above the lowest point of the trough, in m; and (5) the rate of displacement of the bar, which is the rate of displacement of the inflection points on the axial line of the channel in low water, in m/yr. The expediency of calculating these characteristics by computer was examined in the light of establishing indices for identifying point bar type formations of varying origin and for developing relationships between changes in channel shape and fluctuations in water discharge. (See also W71-12843) (Josefson-USGS)
W71-12851

NONSCOURING VELOCITIES OF ASH DEPOSITS ON ASH DUMPS OF THERMAL ELECTRIC POWERPLANTS (O nerazmyvayushchikh skorostyakh zol'nykh otlozheniy na zolootvalakh teplovykh elecktricheskikb stantsiy),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 02J.
W71-12852

HYDRAULIC MODELING OF FLOWS IN BODIES OF WATER (Gidravlicheskoye modelirovaniye techeniy v vodoyemakh),
State Hydrological Inst., Leningrad (USSR).
V. A. Znamenskiy.
In: Gidromorfologicheskiye issledovaniya poymennogo i ruslovogo protesessov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 183, p 180-201, 1970. 2 tab, 15 ref.

Descriptors: *Model studies, *Hydraulic models, *Flow, *Bodies of water, *Simulation analysis, On-site investigations, Runoff, Hydraulic gradient, Wind velocity, Backwater, Froude number, Dimensional analysis, Transition flow, Turbulent flow, Hydraulic similitude.
Identifiers: *USSR, Hydraulic modeling, Hydraulic resistance.

Experimental investigations of hydraulic modeling of flows in bodies of water were examined in the light of current theory and practice. A study of flows in water bodies may be conducted in two ways: (1) by field observations and (2) by laboratory studies on hydraulic models. To conduct studies using hydraulic models it is suggested that natural flows be divided into runoff, gradient, and wind flows and that these flows be studied separately and in various combinations. Modeling of flows at the mouths of rivers in the backwater zone of a water body should be based on the Froude number and on the character of the hydraulic resistances in the body of water. Modeling of flows in the water body itself may be based on dimensional analysis in accounting for bottom hydraulic resistance. In the case of wind flows, which are determined by the tangential tension at the interface of two media, modeling should be based on the scale ratios of such absolute and relative parameters as the coefficients of turbulent exchange and wind velocity on the model and in nature. (See also W71-12843) (Josefson-USGS)
W71-12853

A WET SAND DOSIMETER FOR ADDING SEDIMENTS TO AN ERODIBLE MODEL (Dozimetr syrogo peska dlya podachi nanosov na razmyvayemuyu model'),
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 02J.
W71-12854

8C. Hydraulic Machinery

CAVITATION IN CLOSED CONDUIT FLOW SYSTEMS,
Metropolitan Water, Sewerage and Drainage Board, Sydney (Australia).
L. A. Darvas.
Inst Eng, Aust, Civ Eng Trans, Vol CE12, No 2, p 213-219, Oct 1970. 7 p, 16 fig, 15 ref.

Descriptors: *Cavitation, Cavitation control, *Hydraulic valves, Water hammer, Valves, Fatigue (Materials), Gate valves, Cavitation index, Fluid flow, Energy dissipation, Foreign research, Needle valves, Research and development, Butterfly valves, Cavitation noise, Closed conduits, Hollow jet valves, Control systems, Bibliographies, Air bubbles.
Identifiers: Australia, Cavitation parameters, Expansion chamber.

Designers of pipeline control systems are handicapped by the lack of information on cavitation characteristics of various types of valves and on operating limitations caused by cavitation. A comprehensive, standardized, comparative and corrective laboratory investigation into the cavitation behavior of most frequently used valve types is long overdue. Based on the results of a series of experiments performed in the hydraulic laboratory of the Metropolitan Water, Sewerage and Drainage Board, Sydney, Australia, and on reports released by laboratories from several countries, a review of the valve cavitation phenomena, protective methods, and valve characteristics is presented. Conclusions are: (1) Mild cavitation usually can be tolerated in a system, (2) An expansion chamber will eliminate the undesirable effects of cavitation, (3) Air injection will reduce the intensity of cavitation, (4) Needle valves have favorable cavitation characteristics. (USBR)
W71-12884

OPERATION AND MAINTENANCE OF COLORADO RIVER AQUEDUCT,
Metropolitan Water District of Southern California, Los Angeles.
H. J. Mills.
Proc Amer Soc Civ Eng, J Irrig Drain Div, Vol 97, No IR1, p 203-209, Mar 1971. 7 p, 8 fig, 1 tab.

Descriptors: *Aqueducts, Canals, Conduits, Irrigation, Pumping, Tunnel linings, *Operation and maintenance, *Pumping plants, Tunnels, Cleaning, Waterworks, Pipelines, Siphons, *Friction coefficient (Hydraulic), Spare parts, Impellers, Algae, Distribution systems, Design flow.
Identifiers: Metropolitan Water Dist. of So. Cal., Friction factors, Inventories.

The Colorado River Aqueduct of the Metropolitan Water District of Southern California (MWD) requires a highly efficient maintenance program to permit the original design flow to be exceeded. The MWD is a public agency organized in 1928 to supply water for the rapidly growing coastal plain. In 1946, the San Diego County Water Authority was annexed to the District and brought with it an annual entitlement of 112,000 acre-ft of Colorado River water. The District's entitlement was thereby increased to 1,212,000 acre-ft/yr. The increase required a commensurate increase in flow in the aqueduct. A study indicated that an increase in pumping capacity could be obtained by modifying the centrifugal pump impellers. The increased pumping capacity required developing special maintenance procedures to maintain low friction losses in canals, tunnels, and conduits so that the design flow could be exceeded. This is achieved by daily canal cleaning, well-trained maintenance crews equipped with mobile shops and special cleaning equment, and good coordination of maintenance activities. (USBR)
W71-12888

TURBINE-EFFICIENCY MEASUREMENTS USING A COMMERCIAL QUARTZ THERMOMETER,
Vevey Engineering Works Ltd. (Switzerland).
J. Chappuis, and R. Chenal.
Water Power, Vol 23, No 1, p 15-19, Jan 1971. 5 p, 7 fig, 1 tab, 13 ref.

Descriptors: *Hydraulic machinery, Hydraulic turbines, Accuracy, Field tests, *Pumps, *Efficiencies, *Trubine efficiency, *Temperature sensors, *Quartz, *Acceptance tests, Foreign research, Pump tests, Calibrations, Foreign tests, Instrumentation, Temperature.
Identifiers: Thermodynamic method, Switzerland.

The commercial quartz thermometer, with a claimed resolution of 0.0001 deg C, is a suitable instrument for direct temperature measurements which are the basis of the thermodynamic method used effectively for determining turbine efficiency. The method is one of the most accurate for measuring heads above 100-150 m where the temperature of the working fluid is stable. Results are given for tests made at 3 plants in Switzerland where comparative measurements were made on site on 3 turbines and on a storage pump. In each case, the standard zero thermodynamic method was used as a reference. (USBR)
W71-12895

EVALUATION OF SELECTED EARTHMOVING EQUIPMENT FOR THE RESTORATION OF OIL-CONTAMINATED BEACHES,
URS Research Co., San Mateo, Calif.
For primary bibliographic entry see Field 5G.
W71-13091

8D. Soil Mechanics

DETERMINATION OF CATION EXCHANGE CAPACITY OF EARTH MATERIALS USING A RADIOTRACER TECHNIQUE,
Cold Regions Research and Engineering Lab., Hanover, N.H. Earth Sciences Branch; and Dartmouth Coll., Hanover, N.H. Dept. of Geology.
For primary bibliographic entry see Field 02G.
W71-12272

EFFECT OF GROUNDWATER LEVELS ON STRESS HISTORY OF THE ST. CLAIR CLAY TILL DEPOSIT,
University of Western Ontario, London. Dept. of Engineering Science.
L. G. Soderman, and Y. D. Kim.
Canadian Geotechnical Journal, Vol 7, No 2, p 173-187, May 1970. 6 fig, 3 tab, 24 ref.

Descriptors: *Clays, *Lake soils, *Glacial drift, *Soil strength, *Water levels, Paleohydrology, Hydrogeology, Till, Consolidation, Leaching, Great Lakes, Water level fluctuations.
Identifiers: *Canada, St. Clair clay till.

Over 100 ft of relatively homogeneous and compressible lacustrine clay and clay till deposits cover a large portion of the St. Clair basin in Southwestern Ontario. Based on data from recent laboratory one-dimensional consolidation tests and evidence of a lowered groundwater level in the past, the St. Clair clay till deposits are, in general, lightly overconsolidated at depth, with a heavily overconsolidated crust in the upper 40 ft of the deposit. The evidence of a higher degree of overconsolidation can explain the large discrepancies between predicted and observed settlements of structures founded on the St. Clair clay till. (Knapp-USGS)
W71-12388

RIVERBANK STABILITY STUDY AT THE UNIVERSITY OF ALBERTA, EDMONTON,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W71-12389

REGIONAL GEOLOGY AND LANDSLIDES IN THE MARINE CLAY DEPOSITS OF EASTERN CANADA,
Laval Univ., Quebec. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W71-12390

EFFECTS OF THE ATMOSPHERIC-LITHOSTATIC PRESSURE RATIO ON EXPLOSIVE CRATERS IN DRY SOIL,
National Aeronautics and Space Administration, Hampton, Va. Langley Research Center.
For primary bibliographic entry see Field 08H.
W71-12791

SWELLING CLAY IN TWO SLOPE FAILURES AT TORONTO, CANADA,
University of Western Ontario, London. Dept. of Engineering Science.
For primary bibliographic entry see Field 02G.
W71-12804

INFLUENCE OF THE UNSATURATED FLOW DOMAIN ON SEEPAGE THROUGH EARTH DAMS,
IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.
R. A. Freeze.
Water Resources Researth, Vol 7, No 4, p 929-941, August 1971. 14 fig, 24 ref.

Descriptors: *Unsaturated flow, *Seepage, *Dams, *Mathematical models, *Earth dams, Phreatic lines, Water table, Soil water movement, Saturated flow, Porous media, Water levels, Pressure head, Wetting.
Identifiers: Dam seepage.

An integrated analysis was made of flow through earth dams, considering the entire porous domain. The mathematical model provides a finite difference solution to two- or three-dimensional problems involving transient or steady state flow in the saturated and unsaturated domains of nonhomogeneous, anisotropic dam sections. In general, the water table is not a streamline; in many zoned cross sections, a significant proportion of the paths are unsaturated flow routes for some part of their traverse. In addition, the position of the water table may be quite different from that determined from the classic saturated-only analysis. Unsaturated flow components take on greater importance in small dams, in dams with sloping cores and downstream filter blankets, and in the fine-grained, well-graded soils common to internal cores. A simulation of the transient initial advance problem shows that the rate of growth of the saturated zone is highly dependent on the unsaturated properties of the soils and on the initial moisture contents. In the early stages of seepage following a rapid rise in the upstream reservoir level, inflow rates into the dam may be as much as 100 times the steady state seepage rate. Consideration of the unsaturated zone in the analysis of seepage through earth dams involves added mathematical complexity and requires data on unsaturated soil properties that are not commonly available. (Knapp-USGS)
W71-12832

THE SLURRY TRENCH CUT-OFF FOR THE DUNCAN DAM,
Montreal Engineering Co. Ltd. (Quebec).
D. R. Duguid.
Can Geotech J, Vol 8, p 94-108, 1971. 15 p, 11 fig, 13 ref.

Descriptors: *Slurries, Cutoffs, *Cutoff trenches, Excavation, Failure (Mechanics), Foreign construction, Specifications, Construction methods, Earth dams, Backfills, Dam foundations, Stability analysis, Performance, Stability, Safety factors, Differential settlement, Seepage control, Soil mechanics.
Identifiers: *Slurry trenches, Canada, Duncan Dam, Canada.

A slurry trench cutoff was constructed for the Duncan Dam in Canada. Two failures of the trench wall occurred during construction; one required relocation of a portion of the cutoff to avoid delaying construction of the dam. The relocated cutoff was constructed successfully from a higher ground elevation, using a denser slurry produced by mixing in more silt. To analyze the failures, a nomograph was developed to determine the required slurry density for trench wall stability. The stability analysis, first developed by Morgenstern and Amir-Tahmasseb was confirmed. The hydrostatic head drop across the cutoff varies from 85 to 90% of the gross head on the dam. Differential settlement of almost 10 ft has occurred along the cutoff after completion, without detrimental effects. Readings over the last 3 yr indicate no reduction in the efficiency of the cutoff. (USBR)
W71-12886

THE INFLUENCE OF THE UNSATURATED FLOW DOMAIN ON SEEPAGE THROUGH EARTH DAMS,
R. A. Freeze.
Paper, IBM Thomas J Watson Res Cent, Yorktown Heights, NY, 1971. 39 p, 14 fig, 24 ref.

Descriptors: *Earth dams, *Unsaturated flow, Seepage, Transient flow, Porous media flow, Mathematical models, Finite difference method, Steady flow, Saturated flow, Analytical techniques, Flow nets, Bibliographies, Boundary conditions, Numerical analysis, Computer applications, Soil mechanics.

Failure to consider the unsaturated zone in an earth dam may lead to errors in determining the flow through the dam. An integrated analysis of flow through earth dams considering the entire porous domain is presented. A mathematical model provides a finite difference solution to 2- or 3-dimensional problems involving transient or steady-state flow in the saturated and unsaturated domains of nonhomogeneous, anistropic dam sections. The water table is not a streamline, and the position may be quite different than that determined from the classic saturated-only analysis. In many zoned cross sections a significant proportion of the stream tubes may take unsaturated flow routes for part of the traverse. Unsaturated flow components are more important in: (1) small dams than large dams; (2) dams with sloping cores and downstream filter blankets rather than more homogeneous sections; and (3) fine-grained, well-graded soils common to internal cores rather than more permeable and more uniform soils of external sections. A simulation of the transient initial-advance problem shows that the rate of growth of the saturated zone is highly dependent on unsaturated properties of soils and on initial moisture contents. (USBR)
W71-12890

DUNCAN DAM INSTRUMENTATION,
Montreal Engineering Co. Ltd. (Quebec).
J. L. Gordon.
Water Power, Vol 23, No 1, p 5-9, Jan 1971. 5 p, 8 fig, 3 ref.

Descriptors: *Instrumentation, *Earth dams, *Settlement (Structural), *Measuring instruments, Dam foundations, Dam construction, Seepage, Pore pressure, Movement, Piezometers, Alinement, Tiltmeters, Soil mechanics, Foreign construction, Performance, Structural behavior.
Identifiers: Duncan Dam, Canada, Canada.

Instrumentation of Duncan Dam in Canada and development of a new type settlement gage are described. The dam and foundation were well instrumented with Casagrande and vibrating wire-type piezometers, alinement hubs, tiltmeters, plate-type settlement gages, and new-type settlement gages. The mechanical and magnetic systems were developed and installed to measure settlement to depths of 250 feet in the soft sand-silt foundation. Both systems were installed in cased holes that were backfilled as the casing was withdrawn. A

flexible nylon tube was used to connect the settlement markers to the surface. Settlement markers for the mechanical system were steel anchors. Elevation of the anchors was determined by a steel wire connected to the anchor and extending to the surface through the tube. Markers for the magnetic system were toroidal magnets threaded over the tube and dropped into the hole at the desired depth interval as the hole was backfilled. Elevation of the magnetic markers was determined by lowering through the tube a reed switch which closes in a magnetic field. Buckling of the tube during installation was solved by pretensioning the tube, and allowing settlement to the amount the tube was strained by pretensioning before any compression acted on the tube. (USBR)
W71-12897

8E. Rock Mechanics and Geology

EFFECT OF ROCK CREEP ON STRESS IN THE LINING OF A CIRCULAR TUNNEL,
L. A. Baslavskii.
Hydrotech Constr, No 8, pp 713-717, Aug 1970. 5 p, 3 fig, 1 tab, 6 ref.

Descriptors: Rock mechanics, *Rocks, *Creep, Effects, Stress, Tunnels, Rigid linings, *Tunnel linings, Deformation, Loads (Forces), Analytical techniques, Rigidity, Displacements, Foreign research, Stress analysis
Identifiers: Creep-stress relationship, USSR.

The contact stresses occurring at the surface of a thin elastic circular ring in a medium possessing the property of creep and under an active load are considered. Solution of this problem allows evaluation of the effect of rock creep on the mechanical state of a tunnel lining set up by the mining method. The state of the medium is defined for conditions of plane deformation, symmetrical in relation to a vertical axis through the center of the ring. Application of the loads on the outer contour of the ring instead of at the axis is important. Stress relaxation in the lining cross section resulting from rock creep has a distinct effect on the forces in the lining. Based on the assumption that the active load does not vary during deformation of the lining, the effect of rock creep on a highly rigid lining is negligible, but as the rigidity of the nonvarying active load can be made for tunnels driven by mining methods. For linings of pressed concrete or prefabricated blocks, the creep of the rock must be taken into account in every case, independently of the rigidity of the lining. (USBR)
W71-12885

CONSTRUCTION INNOVATIONS IN RECLAMATION WORK,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 08A.
W71-12892

MEASUREMENTS IN ROCK MECHANICS,
C. Jaeger.
Water Power, Vol 23, No 1, p 10-14, Jan 1971. 5 p, 33 ref

Descriptors: *Rock mechanics, Rock tests, Measurement, Bibliographies, Measuring instruments, *Methodology, In situ tests, Field tests, Seismic investigations, Laboratory equipment, Flat jack method, Foundations, Ultrasonic tests, Underground openings, Reviews.
Identifiers: Borehole deformation gage, Dilatometers, Electromagnetic method, Borehole extensometers, Triaxial cell, Acoustic methods

In rock mechanics many reports on slope stability, dam foundations, or tunneling deal with the theoretical analysis of stresses and strains in rock; however, the use of finite element methods for the most varied rock mechanics problems has advanced considerably. A few practical cases of underground rock excavation show that theoretical research depends on information that only in situ measurements can provide. Instruments used in rock mechanics measurements, and new developments in methods and techniques include: (1) the integral sampling method developed in Portugal; (2) borehole dilatometers, extensometers, and deflectometers; (3) flatjacks; (4) triaxial cells for rock sample tests; (5) the Franklin point-load apparatus; and (6) seismic, acoustic, ultrasonic, and electromagnetic methods. (USBR)
W71-12896

8F. Concrete

FATIGUE STRENGTH OF HOT ROLLED DEFORMED REINFORCING BARS,
University of Alberta, Edmonton, Canada; Stanley and Associates Engineering, Ltd, Edmonton, Canada.
For primary bibliographic entry see Field 08A.
W71-12887

8G. Materials

WHAT EXPERIENCE TEACHES US ABOUT CORROSION,
Universal Oil Products Co., St. Paul, Minn. Johnson Div.
Joe L. Mogg.
Johnson Drillers Journal, p 1-3, March-April 1971. 3 p, 5 fig, 4 tab, 1 ref.

Descriptors: *Corrosion, *Water wells, *Electrolysis, *Water chemistry, *Well screens, Steel pipes, Well casings, Well filters, Wells, Chemical reactions, Metallurgy, Water quality, Corrosion control
Identifiers: *Well screen corrosion.

The following well-screen corrosion guide lines were developed from experience. (1) If low-carbon steel will corrode due to chemical corrosion in a particular type of water, it will corrode faster if connected to a metal below it in the electromotive series. The corrosion rate is reduced considerably at a distance about three diameters away from the connection. This helps explain why stainless steel end fittings should always be used on both ends of stainless steel screens. If they are not, corrosion is concentrated on a relatively small area of mild steel which is welded to the stainless steel. (2) Work-hardened material corrodes faster than the same metal in annealed condition. (3) Stressed parts are more likely to corrode than unstressed parts. (4) Higher temperatures increase corrosion rates; generally rates double for each 40 deg F increase. (5) High fluid velocities increase corrosion rates. (6) Dissolved oxygen in water increases corrosion rates. (7) Generally, electro-chemical corrosion causes loss of material along some portions of screens and casings with corrosion products being redeposited on other portions. This usually occurs in water with relatively high pH and high total dissolved solids (usually 1,000 ppm). Trouble is commonly evidenced by reduction in yield due to plugging of screen openings by corrosion products, followed by screen structural failure. (Knapp-USGS)
W71-12474

TURBINE-EFFICIENCY MEASUREMENTS USING A COMMERCIAL QUARTZ THERMOMETER,
Vevey Engineering Works Ltd. (Switzerland).
For primary bibliographic entry see Field 08C.
W71-12895

MEASUREMENTS IN ROCK MECHANICS,
For primary bibliographic entry see Field 08E.
W71-12896

DUNCAN DAM INSTRUMENTATION,
Montreal Engineering Co. Ltd. (Quebec).
For primary bibliographic entry see Field 08D.
W71-12897

8H. Rapid Excavation

EFFECTS OF THE ATMOSPHERIC-LITHOSTATIC PRESSURE RATIO ON EXPLOSIVE CRATERS IN DRY SOIL,
National Aeronautics and Space Administration, Hampton, Va. Langley Research Center.
R. W. Herr.
National Aeronautics and Space Administration Technical Report NASA TR R-366, September 1971. 88 p, 27 fig, 1 tab, 18 ref, append.

Descriptors: *Craters, *Explosions, *Excavation, *Atmospheric pressure, *Earth pressure, Permeability, Soil mechanics, Explosives.
Identifiers: Lithostatic pressure.

The effects of the atmospheric pressure on the size of explosive craters was experimentally investigated by detonating small spherical high-explosive charges at various depths in a bed of dry, particulate soil contained within a vacuum cylinder. The results indicate that for surface explosions atmospheric pressure has little effect on crater dimensions, but for charges buried beneath the surface, the dimensionless ratio of atmospheric pressure lithostatic pressure can be of major importance. For a constant value of this pressure ratio and a range of charge masses of nearly 11 orders of magnitude, crater dimensions were found to vary as the fourth root of the charge mass and inversely as the fourth root of the product of the soil density and gravitational acceleration. Soil permeability was found to have an appreciable effect on crater dimensions. For cratering experiments conducted under standard atmospheric pressure and gravity conditions, the atmosphere had a relatively greater effect on the small explosions than on the large ones at a given value of the charge-depth parameter. (Knapp-USGS)
W71-12791

8I. Fisheries Engineering

RESPONSES OF FINGERLING COHO AND CHINOOK SALMON TO MODIFIED FLOWS IN A SIMULATED TURBINE INTAKE,
Bureau of Commercial Fisheries, Seattle, Wash.
John G. VanDerwalker.
Transactions of the American Fisheries Society, Vol 99, No 3, p 532-539, July 1970. 7 fig, 1 tab, 5 ref.

Descriptors: *Fish passages, *Salmon, *Dams, *Fish barriers, *Fish guiding, Anadromous fish, Fish behavior, Fish ladders, Fish migration, Intakes, Reservoirs, Chinook salmon, Turbines.
Identifiers: Coho salmon.

The high mortality of juvenile salmon passing through turbines has focused attention on the development of preventative methods. In this study, experiments were conducted to determine if the percentage of fingerling coho (Oncorhynchus kisutch) and chinook (O. tshawytscha) salmon that entered the gatewell of a simulated turbine intake could be increased by modifying the configuration of its ceiling. Two configurations tested substantially increased the number of fish entering the simulated gatewell. (LeGore-Washington)
W71-12316

WARM-WATER REARING OF CARP FOR CONSUMPTION (CYPRINUS CARPIO L.) IN NETTING CAGES (IN GERMAN),
Institut fuer Binnenfischerei, Berlin (West Germany).
Werner Steffens.
Z Fisch Hilfswiss, 18 (1/2): 1-13, 1970 (Engl and Russ summ).

Identifiers: Cages, Carp, Consumption, Cyprinus-Carpio, Netting, Rate, Rearing, Stocking, Warm, Water, Yield.

A test period when fingerling C. carpio weighing 200 to 300 g each had been reared was followed by the rearing of carp for consumption in netting cages from the end of July to the beginning of Dec 1968. The floating netted cages used had a utilizable volume of 6.5 cu m each. Water temperatures were above 27 deg C at the beginning and then declined to about 17 deg C by the end of the test period. The netting cages were stocked at rates of 100, 120, and 200 fish/cu m. The fish were fed on pellets with a crude protein content of 33.7%. In most of the variants the carp had achieved an individual average weight of more than 1000 g after 75 to 118 days of feeding. The individual weight gains of the fish varied between 652 and 1015 g. The fish crop weights amounted to 90.9 to 174.8 kg/cu m, while the total gains amounted to 70.1 to 130.5 kg/cu m, respectively. In case of highest stocking rate 1136 kg carp were harvested per cage. Fish losses totalled 1.6%. At an average daily feed input between 1.87 and 2.88% of the fish weight conversion ratios between 1.61 and 2.25 were reached. The average conversion ratio throughout the test period was 1.86.--Copyright 1971, Biological Abstracts, Inc.
W71-12522

PHYSIOLOGICAL RESULTS OF WARM-WATER REARING OF CARP FOR CONSUMPTION (CYPRINUS CARPIO L.) IN NETTING CAGES (IN GERMAN),
Institut fuer Binnenfischerie, Berlin (West Germany).
Marie-Luise Albrecht.
Z Fisch Hilfswiss. 18 (1/2): 15-34. Illus, 1970 (Engl. and Russ summ).
Identifiers: Cages, Carp, Consumption, Cyprinus-Carpio, Netting, Physiological, Rate, Rearing, Stocking, Temperature, Warm, Water.

The fish were kept at stocking rates of 66 to 200 fish/cu m between April 5 and July 23, 1968 (group 1), July 29 and Oct. 16, 1968 (group 2), and Aug. 21 and Dec 12, 1968 (groups 3 and 4). The temperatures at which the groups were reared significantly differed from each other (group 1 between 21.5 and 25.8 deg C, group 2 between 27.1 and 20 deg C, groups 3 and 4 between 25.9 and 17.3 deg C). The temperature factor greatly influenced the changes of the internal organs. As water temperature went up (group 1), the relative organ weight of liver, spleen, heart, and kidney declined, while the relative erythrocyte volume (Ht) went up. As water temperature declined, the relative weight of these organs again increased (however, this phenomenon was established with certainty only for the liver), while the hematocrit value declined. The development of the gonads was stimulated by stress. In spite of gradual cooling-down of the water, with increased stocking rate (200 fish/cu m) the relative ovary weight increased 3.7 times as much as with low stocking rate (100 fish/cu m). Such processes could not be established for the male gonads. Maturing of sperm and production of milt largely depend on temperature. The protein content of the warm-water reared carp for consumption (carcasses) on an average amounted to 16.3% of the fresh matter, higher than that of pond-reared carp fed on cereal grains. The livers had a high fat content which is frequently found also with pond-reared carp of equal size. Growth retention due to heavy stocking occurred but to a small extent. The success of rearing carp for consumption in netting cages largely depends on the quality of the stocking material which quite often is strongly impaired by inappropriate treatment before stocking.--Copyright 1971, Biological Abstracts, Inc.
W71-12523

THE HISTORIC POND COMPLEX SOUTHEAST OF KLEIN-SAUBERNITZ DISTRICT), (IN GERMAN),
Technische Universitaet, Dresden (East Germany). Fakultaet fuer Mathematik und Naturwissenschaften.
Werner Schmidt.
Z Fisch Hilfswiss. 18 (1/2): 97-105. Map. 1970. (Engl and Russ summ).
Identifiers: Bautzen, Carp, Complex, Fishery, Germany, Historic, Klein-Saubernitz, Pond, Potential, Southeast.

Use of the pond for fishery purposes during the start of the century and its potential use for raising carp are elaborated.--Copyright 1971, Biological Abstracts, Inc.
W71-12525

STUDIES TO INCREASE THE PRODUCTION OF NATURAL FOOD AND THE YIELDS IN THE CARP PONDS BY MULTIPLYING THE EFFECT OF THE FIRST POND FILLING, (GERMAN),
Institut fuer Binnenfischerie, Berlin (West Germany).
Detlev Barthelmes.
Z Fisch Hilfswiss. 18 (1/2): 87-95. Illus. 1970 (Engl and Russ summ).
Identifiers: Carp, Filling, Food, Multiplying, Natural, Pond, Ponds, Production, Reinforced, St, Stocking, Yields.

Reinforced stocking with intermediate catching and drainage during summer makes it theoretically possible to increase production of natural food per square unit by utilizing the effect of 1st or new pond filling. Some test results are very promising. In about 2 mo. an increment of 747 kg/ha in stocking carp 1-2 was obtained.--Copyright 1971, Biological Abstracts, Inc.
W71-12527

STUDIES ON THE OSMOREGULATION OF THE CHUM SALMON, ONCORHYNCHUS KETA (WALBAUM): III. THE TOLERANCE OF ADULT FISH REARED IN A SALT WATER POND TO FRESH WATER,
Tohoku Univ., Sendai (Japan). Faculty of Agriculture.
Masaaki Kashiwagi, and Ryuhei Sato.
Tohoku J Agr Res. 21 (1): 26-31. Illus. 1970.
Identifiers: Adult, Blood, Chum, Concentration, Fish, Fresh, Oncorhynchus-Keta, Osmoregulation, Osmotic, Pond, Reared, Salmon, Salt, Tolerance, Water.

The tolerance of adult O. keta reared in a salt water pond to fresh water was examined. The fish abruptly transferred to fresh water can live for a long time. The water content of the blood increased during the initial days after the transfer. Also, blood osmotic concentration showed a temporary decrease. Both water content and osmotic concentration of the blood in fresh water returned to control level about 3 days after the transfer. The fish can adapt to the diluted salt water like those transferred to fresh water.--Copyrighr 1971, Biological Abstracts, Inc.
W71-12528

THE FALL IMMIGRATION OF JUVENILE COHO SALMON (ONCORRHYNCHUS KISUTCH) INTO A SMALL TRIBUTARY,
Oregon Fish Commission, Newport. Research Div.
Delbert G. Skeesick.
Res Rep Fish Comm Oreg. 2 (1): 90-95. Illus. 1970.

Descriptors:
Identifiers: Behavior, Coho, Fall, Immigration, Imprint, Juvenile, Management, Oncorhynchus-Kisutch, Pattern, Salmon, Tributary.

The Fish Commission operated an upstream-downstream trap on Spring Creek, Wilson River from 1948 through 1958. Each fall an upstream migration of relatively large juvenile coho occurred. An average of 62.6% of the fall upstream migrants survived and returned downstream in the spring as smolts. The fall upstream migrants which survived to the smolt stage averaged 14 mm longer at emigration than smolts which had spend their lives in Spring Creek. The recapture rate of mature fish that had been fall upstream-migrant juveniles was 0.3% while the recapture rate from fish native to the stream was 0.8%. It is theorized that the juveniles had spent the summer rearing in the Wilson River where they had grown rapidly; the juveniles entered Spring Creek in the fall to excape the high, turbulent water conditions of the main river; and adults, that had been immigrants, received a permanent imprint of their natal stream and had returned there rather than to Spring Creek. Observations from 2 other river systems are reported to substantiate the behavior pattern and suggest that other species may have similar habits. Changes in habitat management and research concepts that will be necessary, if this behavior pattern is widespread, are discussed.--Copyright 1971, Biological Abstracts, Inc.
W71-12899

HARVEST OF FOUR STRAINS OF RAINBOW TROUT, SALMO GAIRDNERII, FROM BEARDSLEY RESERVOIR, CALIFORNIA,
California State Dept. of Fish and Game, Sacramento.
Almo J. Cordone, and Stephen J. Nicola.
Calif Fish Game. 56 (4): 271-287. 1970.

Descriptors:
Identifiers: Beardsley, California, Fishery, Harvest, Kamloops, Planting, Rainbow, Reservoir, Salmo-Gairdnerii, Seasonal, Shasta, Strains, Trout, USA.

Four strains of rainbow trout, a wild strain of Kamloops rainbow and 3 domestic strains utilized in California's catchable trout program, were planted as fingerlings in Beardsley Reservoir, Tuolumme County, from 1961 through 1966. Kamloops and Shastas, the most recently developed domestic strain, were decidedly superior to Whitneys and Virginias, 2 strains domesticated since near the turn of the century. The best time of the year to plant Kamloops was in April and May when they were 1.0 to 3.2 per ounce. Shastas planted in July and from 2.5 to 6.2 per ounce were most successful. Comparing groups of these strains planted only at these times showed that Kamloops were harvested at a significantly higher rate than Shastas. Shastas, however, had a higher average ratio of pounds caught to pounds planted, and a lower average cost per pound in the creel. Kamloops displayed a greater tendency to leave the reservoir during periods of spillway discharge, and were less available to shore anglers than the domestic strains. Moreover, they were more difficult to raise in the hatchery. It is believed the performance of Shastas, could be greatly improved if they were available for planting at a larger size in the spring.--Copyright 1971, Biological Abstracts, Inc.
W71-12901

INTRODUCTION OF BLUE CATFISH INTO CALIFORNIA,
California State Dept. of Fish and Game, Sacramento.
William M. Richardson, James A. St. Amant, Lawrence J. Bottroff, and Wayne L. Parker.
Calif Fish Game. 56 (4): 311-312. 1970.

Descriptors:
Identifiers: Blue, California, Catfish, Ictalurus-Furcatus, USA.

On Oct. 23, 1969, 1990 catfish, Ictalurus furcatus, were flown from Stuttgart, Arkansas for introduction into Lake Jennings, San Diego County.--Copyright 1971, Biological Abstracts, Inc.
W71-12902

OCCURRENCE OF KING (CHINOOK) SALMON IN THE KINGS RIVER, FRESNO COUNTY,
Fresno State Coll., Calif.
Peter B. Moyle.
Calif Fish Game. 56 (4): 314-315. 1970.

Identifiers: California, Chinook, County, Fresno, King, Kings, Oncorhynchus-Tshawytscha, River, Salmon, USA.

On April 3, 1970, 3 small salmon Oncorhynchus tshawytscha, were taken from Mill Creek a tributary of the Kings River. Salmon have not been reported in the river since 1942. During high water years it is apparently possible for salmon to enter the Kings River system in limited number.--Copyright 1971, Biological Abstracts, Inc.
W71-12903

ON THE FISHERY POTENTIAL OF THE SEA WATERS OF THE CANADIAN NORTH,
McGill Univ., Montreal (Quebec). Marine Sciences Lab.
M. J. Dunbar.
Arctic. 23 (3): 150-174. Illus. Maps. 1970. (Fr. and Russ. summ.).

Descriptors:
Identifiers: Canadian, Capelin, Climatic, Fishery, Greenland, Halibut, North, Pink, Potential, Redfish, Sea, Shark, Shrimp, Waters.

Fishery potential in the arctic water (water originating in the Arctic Ocean) is negligible. The subarctic, mixed water region is much more productive and supports marine fisheries at present. There is a need for modern methods of processing to meet present market demands. Attention is drawn to the possibilities offered by certain species, such as the Greenland shark, Greenland halibut, capelin, redfish and pink shrimp. The importance of marine climatic change is emphasized.--Copyright 1971, Biological Abstracts, Inc.
W71-12904

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

SEVENTH ANNUAL REPORT MINNESOTA WATER RESOURCES RESEARCH CENTER,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 09D.
W71-12321

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1970.
For primary bibliographic entry see Field 09C.
W71-12369

INVENTORY OF COURSE OFFERINGS IN WATER RESOURCES, THE UNIVERSITY OF CONNECTICUT, 1971-1972,
Connecticut Univ., Storrs. Inst. of Water Resources.
William C. Kennard, and Jane S. Fisher.
Available from the National Technical Information Service as PB-202 699, $3.00 in paper copy, $0.95 in microfiche. Connecticut Institute of Water Resources Storrs, Report No 14, May 1971. 33 p, 4 tab. OWRR Project A-999-CONN (9).

Descriptors: *Water resources research act, *Connecticut, Colleges, Grants, Training, Universities, Education, Facilities, Schools (Education).
Identifiers: *University of Connecticut.

Courses related to Water Resources at the University of Connecticut are listed and described. For convenience in use, the information is divided into four tables. The first one gives complete course descriptions by department and number. The second section lists alphabetically the staff members and, by department and number, the courses for which they are responsible. Table III gives the distribution of courses among the six schools and colleges concerned with this field. In Table IV courses are listed by major water interest categories. (Knapp-USGS)
W71-12420

9C. Research Facilities

INVENTORY OF WATER RESOURCES RESEARCH IN AUSTRALIA, 1970.

Department of National Development, Australian Water Resources Council Report, 1971. 317 p, append.

Descriptors: *Projects, *Hydrology, *Water resources, *Foreign research, *Research facilities, Laboratories, Water resources development, Groundwater, Surface waters, Meteorology, Soil water, Sedimentation, Hydraulics, Urbanization.
Identifiers: *Australia, *Water resources research.

An Inventory of research into water resources and directly related matters in Australia includes research projects in progress during 1970, including those completed or proposed to commence during the year. The information included in the Inventory was sought by means of a letter circulated to 300 research units in October 1970. The basis of the Inventory is the collection of 'Project Details' which are essentially in the form received from cooperating research units. Projects were grouped on the basis of the research unit performing the research. The projects were numbered and arranged serially as indicated in the 'Index of Research Institutions'. The Subject Index is based on about five subject index terms for each project. The titles of projects have been inserted in the subject index against the index term so that a user may review the project titles associated with any given index term. The subject index terms are from the vocabulary of the Water Resources Thesaurus, United States Department of the Interior, Washington, D.C. (Knapp-USGS)
W71-12369

9D. Grants, Contracts, and Research Act Allotments

SEVENTH ANNUAL REPORT MINNESOTA WATER RESOURCES RESEARCH CENTER,
Minnesota Univ., Minneapolis. Water Resources Research Center.
William C. Walton.
Available from the National Technical Information Service as PB-202 627, $3.00 in paper copy, $0.95 in microfiche. Bulletin 41, August 1971. 97 p. OWRR Project A-999-MINN (21).

Descriptors: *Research, Water resources, *Minnesota, *Education, Expenditures, Manpower, Water managment (Applied), Water pollution, Water Resources Research Act, Training.
Identifiers: *Applied research, *Basic research, Physical-biological-economic-social aspects, Faculty.

The fiscal year 1971 budget of the Center was $325,261. The Center financed 17 research projects involving 15 faculty members. These research projects were concerned with: watershed hydrographs, water quality control economics, computer programs in hydrology, water resources administration, eutrophication in Lake Superior, phosphorus and lake pollution, overfertilization of surface waters, mist irrigation, soil water movement, participatory ecology, Mississippi river ecology, area financing of water resources development, perception of water resources problems, adoption of industry of water pollution control measures, and attitudes towards water resources. About 56 students received employment through the Center's program. There were 28 new courses in water resources developed and 4 staff members added to water resources programs. During the academic year, 1968-69, there were 27 reports generated through research projects. (Walton-Minnesota)
W71-12321

INVENTORY OF COURSE OFFERINGS IN WATER RESOURCES, THE UNIVERSITY OF CONNECTICUT, 1971-1972,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 09A.
W71-12420

10. SCIENTIFIC AND TECHNICAL INFORMATION

'POLYWATER': EVIDENCE FROM ELECTRON SPECTROSCOPY FOR CHEMICAL ANALYSIS (ESCA) OF A COMPLEX SALT MIXTURE,
Purdue Univ., West Lafayette, Ind. Dept. of Chemistry; Bell Telephone Labs, Murray Hill, N.J.; and Hewlett-Packard Co., Palo Alto, Calif.
R. E. Davis, D. L. Rousseau, and R. D. Board.
Science, Vol 171, No 3967, p 167-170, January 15, 1971. 4 p, 7 fig, 1 tab, 14 ref.

Descriptors: *Water structure, *Water properties, *Water chemistry, *Aqueous solutions, Spectroscopy, Chemical analysis, Water analysis, Ions, Chemical properties, Density, Electrolytes, Hydrogen bonding, Physical properties, Viscosity.
Identifiers: *Electron spectroscopy, *Polywater, *Anomalous water.

The ESCA spectra of 'polywater' show that this anomalous, high-density, viscous, nonvolatile material contains high concentrations of sodium, potassium, sulfate, chloride, nitrate, borates, silicates, and carbon-oxygen compounds with trace amounts of other impurities but very little water. On the basis of this evidence, in conjunction with reported spectroscopic and analytical experiments, it is very unlikely that a polymerized form of water has been discovered. (Knapp-USGS)
W71-12268

BIBLIOGRAPHY ON ATMOSPHERIC (CYCLIC) SEA-SALTS,
Army Natick Labs., Natick, Mass. Earth Sciences Lab.
For primary bibliographic entry see Field 02B.
W71-12278

QUADRILINGUAL COLLECTION OF USUAL WORDS IN HYDROLOGY,
Office de La Recherche Scientifique et Technique Outre-Mer, Paris (France). Hydrology Section.
Pierre Dubreuil.
ORSTOM, Initiations-Documentations Techniques, No 12, 1969. 113 p.

Descriptors: *Publications, *Translations, *Hydrology, *Hydrogeology, *Foreign research.
Identifiers: *Dictionaries, *Glossaries, French, Spanish, Portuguese.

The words most frequently used in French, English, Spanish, and Portuguese language hydrological publications are compiled to aid hydrologists in dealing with foreign references. The collection is in two parts, one listing the words alphabetically by language, and the other associating the equivalent words in the four languages. The volume of the collection was reduced by eliminating easily recognizable words, particularly those differing only in their endings. Some definitions and explanations are given, although this list is not intended to be a formal dictionary. (Knapp-USGS)
W71-12291

DESIGN, CHARACTERISTICS FOR A NATIONAL SYSTEM TO STORE, RETRIEVE AND DISSEMINATE WATER DATA.

Federal Interagency Water Data Handling Work Group Report (Impaneled by Geological Survey, Office of Water Data Coordination, Washington, D. C.), August 1971. 57 p, 2 fig, 13 tab, append.

Descriptors: *Water resources, *Data storage and retrieval, *Inter-agency cooperation, *Decision making, Network design, Operations research, Data processing, Data transmission, Dynamic programming, Methodology, Statistics, Standards, Monitoring, Design criteria.
Identifiers: *National Water Data Exchange (NAWDEX), *Systems central, Formats, Data handling groups.

Design characteristics are described for a Data Handling Subsystem referred to as the National Water Data Exchange (NAWDEX). Such a water-data handling system will facilitate the exchange of information among collector and user groups. This report was prepared by an interagency Work Group impaneled by the Geological Survey's Office of Water Data Coordination under authority of Circular A-67, Office of Management and Budget,'...to organize the national network data....' Prime purpose of NAWDEX is to provide uniform means for handling water data so that the data are readily and conveniently available to all users. Summary recommendations include the creation of a coordinated Systems Central for (1) storing the data on all parameters in the system so as to permit conversion from one format to another, (2) preparing an index for listing of data holdings and publications available from the various agencies, and (3) designing a format for data presentation that would be used by member agencies. A summary is given of information received from a questionnaire sent to Federal Advisory Committee members to obtain data-needs interests and practices of agencies active in water resources. (Lang-USGS)
W71-12583

DENSITY CURRENTS AND TURBIDITY CURRENTS IN WASTE DISPOSAL IN THE OCEAN--A LITERATURE REVIEW,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-12665

INSTITUTIONAL ASPECTS OF WATER RESOURCES DEVELOPMENT - A BIBLIOGRAPHY.
Water Resources Scientific Information Center, Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-12688

ENVIRONMENTAL FACTORS IN COASTAL AND ESTUARINE WATERS, BIBLIOGRAPHIC SERIES - VOLUME I, COAST OF OREGON,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 02L.
W71-12704

ENVIRONMENTAL FACTORS IN COASTAL AND ESTUARINE WATERS, BIBLIOGRAPHIC SERIES - VOLUME II, COAST OF WASHINGTON,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 02L.
W71-12705

CONTROL OF HAZARDOUS POLLUTING SUBSTANCES.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 05G.
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OIL POLLUTION OF THE MARINE ENVIRONMENT - A LEGAL BIBLIOGRAPHY.
United States Senate Committee on Public Works, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-12775

DROUGHT BIBLIOGRAPHY,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Environmental Data Service.
For primary bibliographic entry see Field 02A.
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the EPA-Water Quality Office, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Water Quality Office of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association Research Foundation.

Subject Fields

- NATURE OF WATER
- WATER CYCLE
- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
- WATER QUALITY MANAGEMENT AND PROTECTION
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